A STUDY ON INCIDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES

Dissertation submitted in

Partial fulfilment of the regulations required for the award of

M.S. DEGREE

In

GENERAL SURGERY – BRANCH - I

THE TAMILNADU

DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL, 2013.

CERTIFICATE

This is to certify that this dissertation titled ***"A Study On Incidence Of Malignancy In Patients Undergoing Surgery For Benign Thyroid Diseases"*** submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the requirement for the award of M.S Degree Branch - I (General Surgery) is a bonafide work done by Dr. Elankumar S, post graduate student in General Surgery under my direct supervision and guidance during the period of September 2011 to November 2012.

Prof.V Elango, M.S.
Professor of Operative Surgery,
Dept. of General Surgery,
Coimbatore Medical College Hospital.

Prof. P.V. Vasantha Kumar, M.S.
Professor and Head of the Department
Dept. of general Surgery
Coimbatore Medical College Hospital

Dr. Vimala, M.D.
Dean,
Coimbatore Medical College Hospital

Coimbatore Medical College

COIMBATORE, TAMILNADU, INDIA - 641 014

(Affiliated to The Tamilnadu Dr. MGR Medical University, Chennai)

ETHICS COMMITTEE

CERTIFICATE

Name of the Candidate : DR. S. ELANKUMAR

Course : M.S. GENERAL SURGERY

Period of Study : SEPTEMBER 2011 - NOVEMBER 2012

College : COIMBATORE MEDICAL COLLEGE

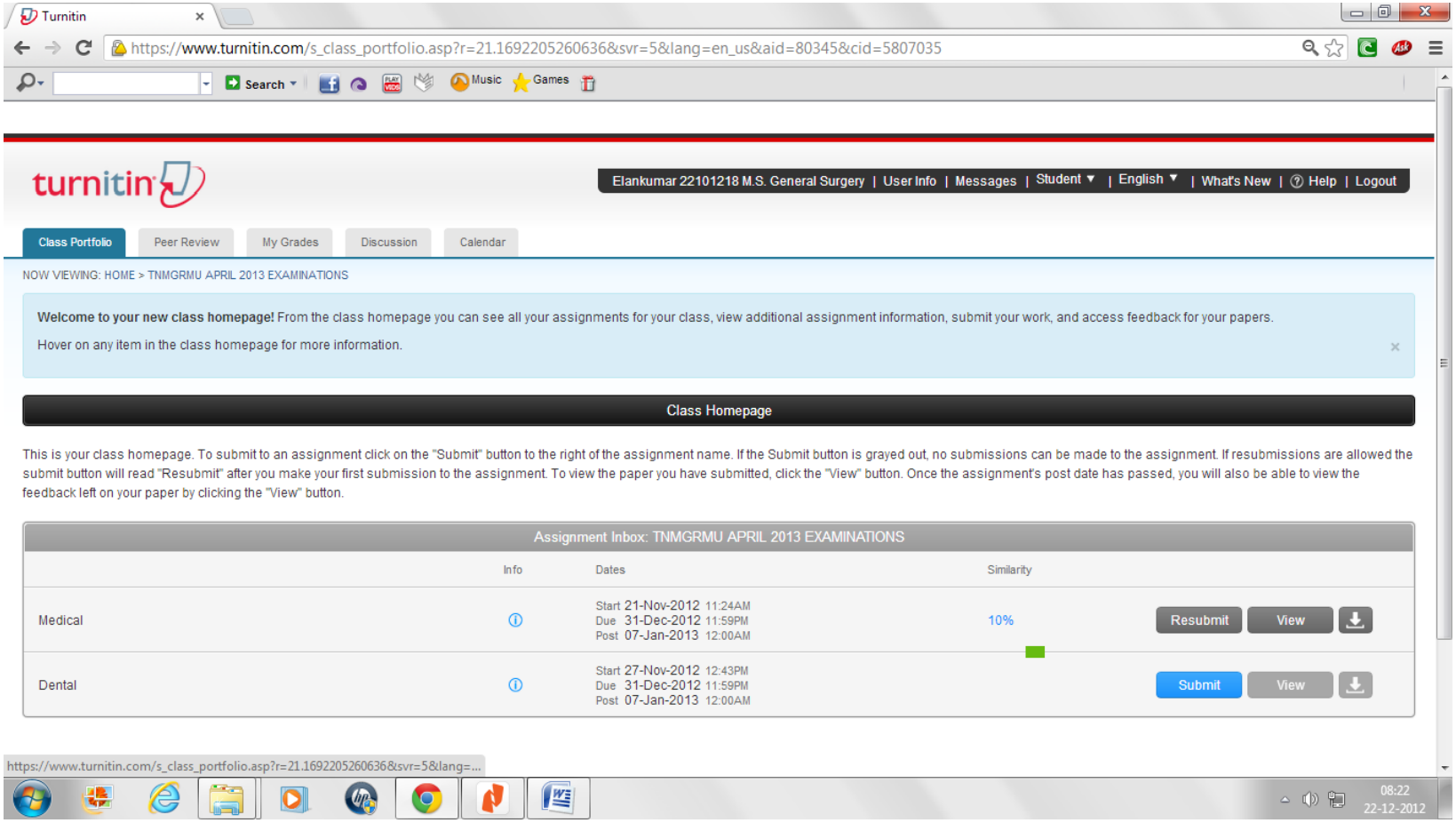
Dissertation Topic : INCIDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES IN CMCH

The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation Proposal is accepted / ~~Not accepted~~ and you are permitted / ~~Not permitted~~ to proceed with the above Study.

Coimbatore - 14.

Date : 23.9.11

Secretary
Ethics Committee


Turnitin
https://www.turnitin.com/s_class_portfolio.asp?r=21.1692205260636&svr=5&lang=en_us&aid=80345&cid=5807035
Search
Music
Games
turnitin
Elankumar 22101218 M.S. General Surgery | User Info | Messages | Student | English | What's New | Help | Logout
Class Portfolio
Peer Review
My Grades
Discussion
Calendar
NOW VIEWING: HOME > TNMGRMU APRIL 2013 EXAMINATIONS
Welcome to your new class homepage! From the class homepage you can see all your assignments for your class, view additional assignment information, submit your work, and access feedback for your papers.
Hover on any item in the class homepage for more information.
Class Homepage
This is your class homepage. To submit to an assignment click on the "Submit" button to the right of the assignment name. If the Submit button is grayed out, no submissions can be made to the assignment. If resubmissions are allowed the submit button will read "Resubmit" after you make your first submission to the assignment. To view the paper you have submitted, click the "View" button. Once the assignment's post date has passed, you will also be able to view the feedback left on your paper by clicking the "View" button.
Assignment Inbox: TNMGRMU APRIL 2013 EXAMINATIONS
Info
Dates
Similarity
Medical
Start 21-Nov-2012 11:24AM
Due 31-Dec-2012 11:59PM
Post 07-Jan-2013 12:00AM
10%
Resubmit
View
Dental
Start 27-Nov-2012 12:43PM
Due 31-Dec-2012 11:59PM
Post 07-Jan-2013 12:00AM
Submit
View
https://www.turnitin.com/s_class_portfolio.asp?r=21.1692205260636&svr=5&lang=...
08:22
22-12-2012

turnitin

Your digital receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

Paper ID	294549801
Paper title	A STUDY ON INCIDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES
Assignment title	Medical
Author	Elankumar 22101218 M.S. General Surgery
E-mail	drslankar86@gmail.com
Submission time	22-Dec-2012 08:14AM
Total words	15921

First 100 words of your submission

A STUDY ON INCIDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES Dissertation submitted in Partial fulfilment of the regulations required for the award of M.S. DEGREE In GENERAL SURGERY – BRANCH - I THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI APRIL, 2013. CERTIFICATE This is to certify that this dissertation titled "A Study On Incidence Of Malignancy In Patients Undergoing Surgery For Benign Thyroid Diseases" submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the requirement for the award of M.S Degree Branch - I (General Surgery) is a bonafide work done by Dr. Elankumar S, post graduate student in General Surgery...

Copyright 2012 Turnitin. All rights reserved.

ACKNOWLEDGEMENT

I express my sincere thanks and gratitude to our Dean **DR. R.VIMALA M.D.** for allowing me to utilize the hospital facilities for conducting this study.

I take this opportunity to express my profound gratitude to Professor of Surgery and Head of the Department, **Prof. Dr. P.V.VASANTHA KUMAR M.S.,** for his support and encouragement throughout this study.

I sincerely thank my Unit Chief **Prof. Dr.V.ELANGO, M.S.,** Professor of Operative Surgery, for his constant guidance and motivation throughout the period of this study.

I am extremely thankful to **Prof. Dr.P.SWAMINATHAN, M.S., Prof.Dr.RANGANATHAN, MS., Prof.Dr.NATARAJAN, MS.,** and **Prof.Dr.RAVINDRAN, MS.,** the chiefs of other surgical units for gracefully granting permission to include their respective unit patients in my study.

I sincerely thank all my assistant professors who gave valuable suggestions and guidance for me to conduct this study.

I thank all my colleagues, paramedical persons and more importantly all my patients for their kind cooperation extended to me throughout the study.

DECLARATION

I hereby declare that the dissertation entitled ***" A STUDY ON INCDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES "*** was done by me at Coimbatore Medical College Hospital Coimbatore under the guidance and supervision of **Prof. Dr. V.Elango M.S.,** Professor of Operative surgery, Department of General Surgery, Coimbatore Medical College, Coimbatore – 641018 during the period of my post graduate study for M.S. Degree Branch-1 (General Surgery) from 2011 to 2012.

This dissertation is submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial fulfilment of the University regulations for award of M.S., Degree in General Surgery.

Dr. S.Elankumar
Post Graduate Student
M.S. General Surgery
Coimbatore Medical College Hospital

CONTENTS

LIST OF IMAGES TABLES

A STUDY ON INCIDENCE OF MALIGNANCY IN PATIENTS UNDER GOING SURGERY FOR BENIGN THYROID DISEASES

ABSTRACT:

Keywords: Incidental thyroid carcinoma, Total thyroidectomy, Benign thyroid diseases.

BACKGROUND:

Total thyroidectomy has been suggested by many people at various places for benign thyroid conditions which needs surgical intervention. According to them, one of the important factor in substantiating total thyroidectomy is increased occurrence of incidental carcinoma in resected thyroid specimens. This study was conducted in our hospital to know the incidence of malignancy reported post operatively.

METHOD:

This was a prospective observational study conducted in Coimbatore Medical College Hospital from the period of September 2011 to November 2012. This study included 109 consecutive patients operated for benign thyroid conditions in our hospital. Patients having proven cytological diagnosis of malignancy were excluded from the study. Specimens of any form of thyroid surgeries(Hemithyroidectomy, subtotal thyroidectomy, Near total thyroidectomy, Isthumectomy) done for benign thyroid conditions were subjected to HPE by serial sectioning technique. HPE reports were documented and analysed.

RESULTS:

Out of 109 patients (94 females and 15 males in the age range 16-88years), 7 patients were found harbouring malignancy in the resected specimens(6.4%). There were 2 papillary micro carcinoma, 1 papillary carcinoma, 2 follicular carcinoma, 1 minimally invasive follicular carcinoma and 1 lymphoma. Also it was observed that, there was no significant difference in the incidence of malignancy in MNG(6.5%) and SNG(5.4%) patients.

CONCLUSION:

According to this study, the incidence of thyroid malignancy detected in patients operated for benign conditions was 6.4%. Considering the morbidity associated with total thyroidectomy, it can be concluded that for benign thyroid conditions, conservative thyroid surgery followed by subjecting the specimens for thorough HPE examination and regular follow up of patients is sufficient, so that, positive cases of malignancy can be detected and treated accordingly.

LIST OF COLOUR PICTURES

INTRODUCTION

Goiter is defined as an enlargement of the thyroid gland. It may be diffuse or nodular. It may be toxic and non toxic. Further more, goiters are divided into endemic and sporadic depending on the prevalence of goiter in that area. World wide, nodular goiter remains an important health problem.

Benign thyroid swellings like nodular goiter and autoimmune thyroiditis are the most common thyroid diseases in our country. Although they are benign, they may harbour malignancy that requires prompt and accurate diagnosis.

The thyroid malignancy remains the most common endocrine malignancy and have very good prognosis except few. Occult malignancies in thyroid swellings are increasingly reported nowadays worldwide due to improved diagnostic modalities. According to the literature incidental malignancies are more common in endemic areas.

In this part of Tamil Nadu, the soil has low iodine content and thyroid diseases are more prevalent. Hence this is conducted here to study incidence of malignancies in patients operated for presumably benign thyroid diseases.

AIM OF THE STUDY

Objectives of this study are:

1. To find out the incidence of thyroid malignancy in patients undergoing surgeries for apparently benign thyroid diseases in CMCH.
2. To study its distribution in age, sex, clinical presentation, and histological types.

3. To find out the incidence of malignancy in patients with follicular neoplasm.

REVIEW OF LITERATURE

HISTORY [3,4]

The name ‘GOITER’ was known since 2700 B.C, and was derived from the latin word ‘GUTTER’, meaning throat. In the 7th century A.D, ‘Paul of Aegina’ was the first physician who reported goiter. Initially he called it as bronchocele. In 1619 A.D, ‘Fabricus’ identified the thyroid gland and identified that the goiters arise from it. The name ‘Thyroid gland’ was derived from the greek word ‘thyreoeides’ meaning shield shaped, it was meant to refer thyroid cartilage initially. The name thyroid was given by ‘Thomas Wharton’ in 1656 A.D.

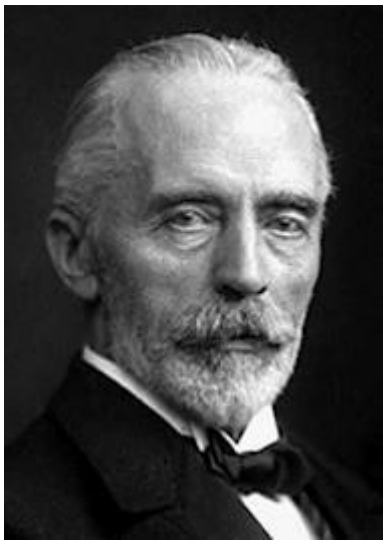
Most people believed that goiters were caused by a toxin, a bacterium or a parasite in water. ‘Graves and Basedow’ reported patients with goiter and palpitations. In 1820s the burnt seaweed containing iodine was found to treat goiters.

Hypothyroidism was first defined in London in 1870s and was called ‘Myxedema’. In 1895 ‘Baumann’ found iodine in thyroid gland. In 1914 ‘Kundal and Osterberg’ isolated and named ‘thyroxin’. In early 20th century it was found that small amount of iodine given to school girls in Akron, Ohio prevented goiters.

The first documented thyroid surgery for goiter was done by 'Roger Frugardi' in 1170A.C, by seton suturing which had very high morbidity and mortality. With the advent of general anaesthesia, antiseptic techniques and hemostasis, in the latter half of 19^{th} century, thyroid surgery had its peak evolution in reducing morbidity and mortality.

Emil Theodor Kocher(1841-1917), C.A. Theodar Billroth(1829-1894), Charles Mayo(1866-1939),William Halsted(1852-1922) & George Crile(1864-1943) in the western world contributed a lot for thyroid surgeries. After that thyroid surgery had evolved little, till now.

Theodor Kocher was given Nobel prize in the field of medicine in 1909 for his works on the thyroid gland.

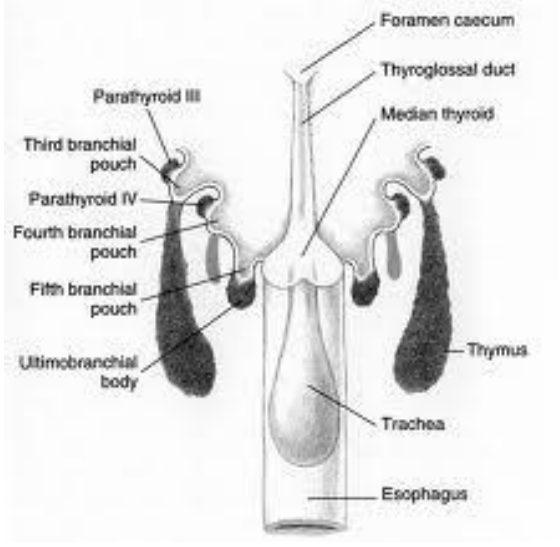


Theodar Kocher (1841-1917)

THYROID ANATOMY

EMBRYOLOGY[1,3,4]:

The thyroid gland develops from the midline diverticulum of primitive foregut. It arises from the foramen caecum at the tongue base. The midline diverticulum forms the medial thyroid anlage that is connected to foramen caecum through thyroglossal duct. Thyroid follicles arise from the cells of medial thyroid anlage. Lateral thyroid anlage arises from the fourth branchial pouch and fuses with medial thyroid anlage. The lateral anlage gives rise to para follicular cells. They are neuroectodermal in origin. Thyroid gland development starts around third week of intrauterine life and colloid synthesis starts around eleventh week of gestation.



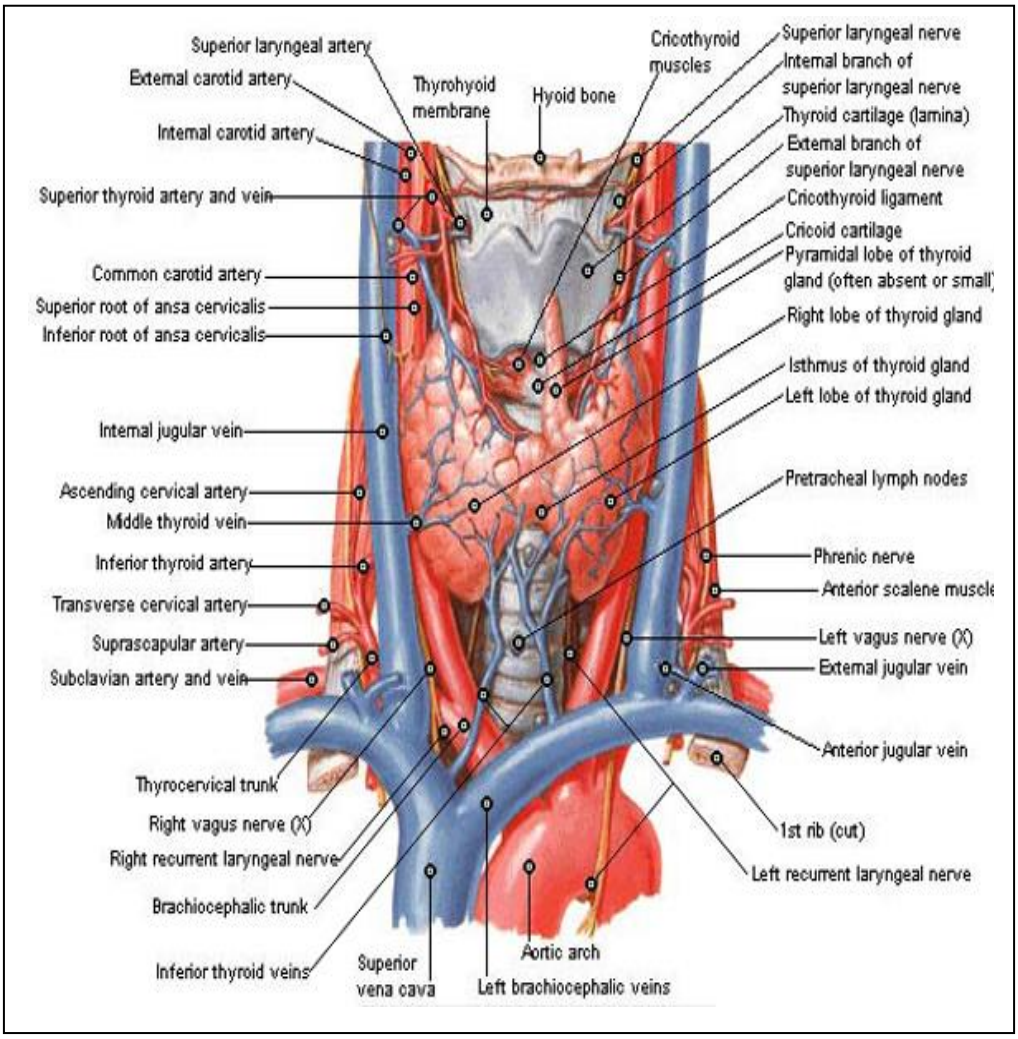
Thyroid Developement

THYROID GLAND[1,3,4]:

Thyroid is a highly vascular gland having two symmetrical lateral lobes united by an isthmus that is 'H' or 'U' shaped. It is situated in the anterior aspect of lower neck and its extent is from C5 to T1 level. It weighs around 25-30gms. It is covered by its own capsule and an envelope of pretracheal fascia. The lobes on either side extend from the oblique line of thyroid cartilage superioly, to 5^{th} or 6^{th} tracheal ring inferiorly. Isthmus lies infront of the 2^{nd}, 3^{rd} and 4^{th} tracheal rings.

The lateral lobes are approximately triangular in cross section, having lateral, medial and posterior surfaces. The lateral surface lies deep to the strap muscles. The medial surface is related to lateral aspect of larynx, upper trachea, lower pharynx , upper esophagus, cricothyroid and inferior constrictor muscles, recurrent and external laryngeal nerves. The posterior surface lies over the medial part of carotid sheath. The posterior surface of isthmus is firmly adherent to 2^{nd},3^{rd} and 4^{th} tracheal rings through pretracheal fascia.

The pretracheal fascia merges with the thyroid capsule posteriorly and laterally to form suspensory ligament of Berry. It is attached to the cricoid cartilage and to the upper tracheal rings which is responsible for up and down movement of thyroid gland during swallowing along with the larynx.



RECURRENT LARYNGEAL NERVES[1,3,4]:

The right and left recurrent laryngeal nerves are branches of right and left vagus nerves respectively. The left recurrent laryngeal nerve recurves around the arch of aorta in the superior mediastinum and enters the tracheo esophageal groove and usually passes posterior to inferior thyroid artery, though variations may be present . The right nerve recurves around the right subclavian artery at the root of the neck and passes in the

tracheoesophageal groove. They provide motor supply to all pharyngeal muscles except cricothyroid and sensory supply to larynx and trachea.

EXTERNAL LARYNGEAL NERVES[1,3,4]:

The external laryngeal nerve is also a branch of vagus nerve arising at the base of the skull, descends along internal carotid and lies closely behind the superior thyroid artery, runs on the surface of inferior constrictor muscle to supply cricothyroid.

PYRAMIDAL LOBE[1,3,4]:

A pyramidal lobe may be present in around 50% of patients, projecting upwards from isthmus usually left to the midline. It develops from the distal end of thyroglossal duct. It may be attached to inferior border of the hyoid bone through fibromuscular tissue named 'levator glandulae thyroidae'.

THE PARATHYROIDS[1,3,4]:

The parathyroid glands usually lie behind the posterior surface of lateral lobes between thyroid and pretracheal fascia. They are usually four in number and each weighs around 40-50mgs.The superior gland is more constant in location, lies in middle of the back of the lobe at the level of first tracheal ring above inferior thyroid artery. The inferior gland lies

usually within the pretracheal fascia behind the lower pole, buts its position may be highly variable.

BLOOD SUPPLY[1,3,4]:

The thyroid gland receives its blood supply from superior and inferior thyroid arteries. Rarely in <3% 'thyroidae ima' artery a direct branch of aorta also produces little contribution.

Superior thyroid artery is the first branch of external carotid artery and it pierces the pretracheal fascia as single vessel to reach upper pole of lateral lobe. The artery divides into anterior and posterior branches. The anterior branch runs down to isthmus to anastomose with its fellow artery from opposite side and the posterior branch descends on posterior surface to anastomose with inferior thyroid artery.

The inferior thyroid artery is a branch from thyrocervical trunk, that arches upwards and medially behind the carotid sheath and then passes downwards to the lower pole. It usually divides outside the pretracheal fascia into branches and pierce pretracheal fascia to reach the lower part of the gland. It supplies both superior and inferior parathyroid glands. During surgery it should be ligated well away from the gland, due to close proximity of recurrent laryngeal nerve to its branches.

Venous drainage of the gland is through the superior , inferior and middle thyroid veins. Superior thyroid veins runs laterally along with superior thyroid arteries and drain into internal jugular vein directly. Middle thyroid veins also drains directly into internal jugular vein they are less consistent and sometimes may be multiple. During thyroid surgeries they should be ligated first. Both inferior thyroid veins joins to form a plexus and drains into brachiocephalic veins.

LYMPHATIC DRAINAGE:

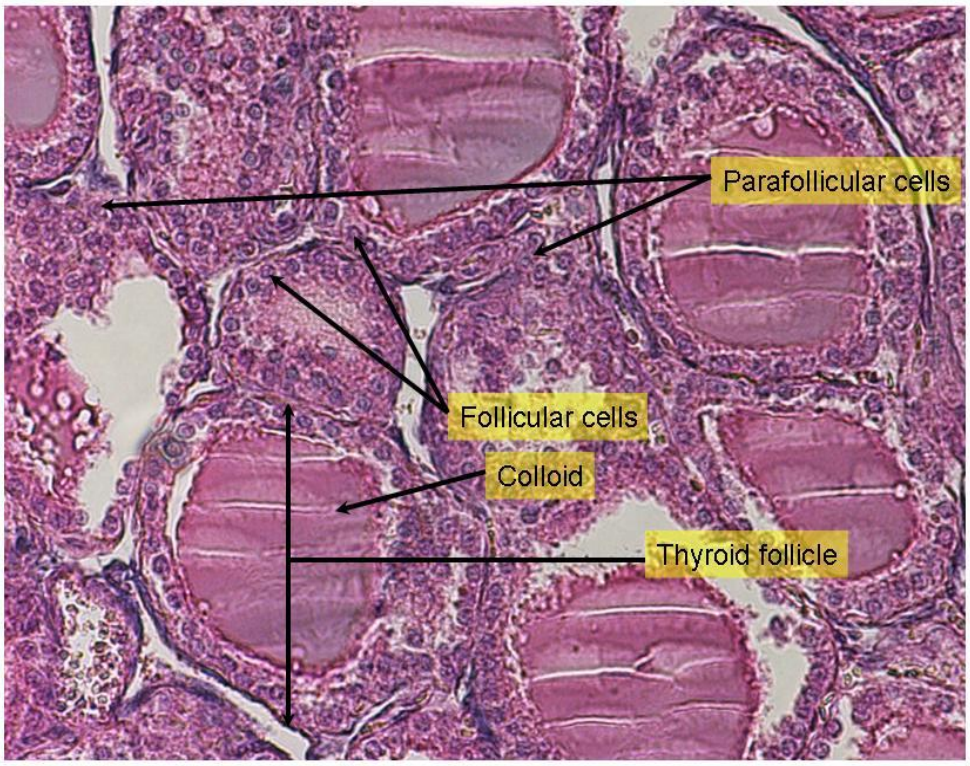
Thyroid gland has rich lymphatic supply. Lymphatic channels are present just beneath the thyroid capsule and they are highly intercommunicating. They drain mainly to deep cervical nodes, pre and para tracheal nodes, superior mediastinal nodes, nodes in relation to upper 3^{rd} of esophagus.

NERVE SUPPLY[1,3,4]:

Thyroid gland receives its sympathetic supply from superior, middle and inferior sympathetic ganglia. They reach the gland along with arteries. They are vasomotor to the gland. Parasympathetic supply is from the vagus nerve through its laryngeal branches.

HISTOLOGY[1,2,3,4,7,8]:

Thyroid gland is divided into multiple lobules through multiple septae entering into the gland from capsule. Each lobule has multiple follicles. Each follicle has a single layer of cuboidal cells surrounding a cavity containing thyroglobulin(colloid). Spaces in between follicles contain extensive capillary and lymphatic channels. They also contain connective tissues and parafollicular cells. During hyperfuntioning state, follicular cells become more columnar with decreased colloid substance. While in hypofunctioning state, follicular cells become more flat and follicles will contain abundant colloid substance.



PHYSIOLOGY OF THE THYROID[3,4,5,6]

Thyroid gland is an endocrine gland that secretes the hormone tri-iodothyronine(T3), tetra-iodothyronine(T4) and reverse tri-iodothyronine(rT3). T3&T4 are metabolically active, rT3is metabolically inactive. Thyroid hormones are synthesized in thyroid follicles.

PITUITARY THYROID AXIS:

Thyroid stimulating hormone (TSH), secreted by anterior pituitary is the main regulating factor in thyroid hormone synthesis. Thyrotropin, a hormone secreted from the hypothalamus stimulates TSH synthesis and increased levels of circulating thyroid hormones (mainly T3) inhibits TSH secretion from anterior pituitary. Increased T3 has negative feedback effect both in hypothalamus and pituitary.

TSH acts on TSH-receptor (TSH-R) situated in the basolateral surface of thyroid follicular cells. It stimulates the follicular cells to increase the synthesis of thyroglobulin and thyroid hormones. It also promotes growth and differentiation of follicular cells.

IODINE METABOLISM IN THYROID:

Iodine is essential for thyroid hormones synthesis. Iodine is absorbed in the proximal small intestine in iodide form. Iodide is transported into the follicular cells against high concentration gradient via sodium-iodine

symporter situated in the basolateral surface of follicular cells. About 90% of iodine in the body is in the thyroid gland. Iodide is oxidised to iodine and transported to exocytic vesicles to form iodotyrosyl residues and stored along with thyroglobulin as colloid in the cavity.

SYNTHESIS AND TRANSPORT OF THYROID HORMONES:

Thyroglobulin(Tg) is a large glycoprotein, containing multiple tyrosine residues. Oxidised iodine bind to tyrosine residues in Tg to form monoiodotyrosine(MIT) and diiodotyrosine(DIT), catalysed by thyroid peroxidase enzyme situated in apical surface of the follicular cells. Coupling of MIT & DIT gives rise to T3. Coupling of DIT&DIT gives rise to T4. Both T3 and T4 are bound to Tg and stored in the colloid. When need arises Tg is taken back into the follicular cells by endocytosis. Proteolysis occurs in lysosomes to release thyroid hormones. They diffuse along the basolateral surface to enter the circulation. Rest of the Tg is secreted again into the follicular cavity.

Thyroid gland produces predominantly T4 and less amount of T3. Majority of T3 is produced by peripheral deiodination of T4 that occurs in the liver, muscles, brain, kidneys. T3 is the most active thyroid hormone. >99% of thyroid hormones are protein bound, mainly thyroxine-binding globulin. Only free(unbound) thyroid hormones are active. The half life of T3is <1day whereas half life of T4 is around 7

days. Thyroid gland can store the reserve of thyroid hormones for 10-14 days.

THYROID HORMONE-FUNCTIONS:

Thyroid hormones are necessary to maintain normal metabolic activities. They are mandatory for fetal brain development and skeletal maturation. They sensitise the heart to adrenaline, increase the BMR, regulates respiratory drive. They increase GI motility, plays vital role in carbohydrate, protein and fat metabolism.

EPIDEMIOLOGY

The most common thyroid disease in the community is simple goiter.The most common cause of thyroid diseases in the world is iodine deficiency that leads to goiter formation and hypothyroidism. In iodine sufficient areas, thyroid diseases are mainly caused by autoimmune diseases,that leads to hypo/hyperthyroidism.

A region is said to be endemic for goiter, if the prevelance of goiter is more than 10% among the children aged 6 to 12 years in that region. If the prevalence is less than 10% it is termed sporadic goiter.

In western countries the incidence of goiter has come down following measures like fortification of salt, fortification of fertilizers etc. Yet in certain parts of asia, Africa, Europe there is higher prevalence of goiter.

In India there is a goiter belt along the northern border extending from Jammu and Kashmir eastward along the southern valleys and foothills of Himalayas into Assam. Endemic goiter is also prevalent in Southern India. Coorg in Karnataka, north Arcot, foothills of Nilgris and Coimbatore are considered as endemic areas.

Recent studies shows high frequency of thyroid disorders being detected in diabetes mellitus patients. High prevalence of hypothyroidism is seen in patients with Down's and Turner's syndrome.

Thyroid carcinoma contributes less than 2% of all malignancies and is also the most commonly seen endocrine malignancy(around 90%). Incidental carcinomas in thyroid are more common in endemic areas.

PATHOLOGICAL CLASSIFICATION OF THROID DISEASES[7,8]

1.THYROIDITIS

A. Acute thyroiditis

B. Granulomatous (De Quervain's) thyroiditis

C. Other granulomatous inflammations

D. Auto immune thyroiditis

- Hashimoto's thyroiditis

- Lymphocytic thyroiditis

E. Reidel's thyroiditis

2.HYPERPLASIA

A. Dyshormonogenic goiter

B. Grave's disease(Diffuse toxic goiter)

C. Nodular hyperplasia

3.TUMOURS

A. Epithelial tumours

- Follicular adenoma

- Papillary carcinoma

- Follicular carcinoma

- Hurthle cell tumours
- Clear cell tumours
- Squamous cell, mucinous and related tumours
- Poorly differentiated carcinoma
- Undifferentiated carcinoma

B. Medullary carcinoma and related neuroendocrine tumours

C. Lymphoid tumours and tumour like conditions

D. Mesenchymal tumours

E. Other primary tumours and tumour like conditions

F. Metastatic tumours

BENIGN DISEASES OF THYROID[3,4,6,7,8]

ACUTE THYROIDITIS:

Acute thyroiditis occurs due to infectious etiology of the thyroid, commonly following bacterial infection rarely fungi, parasites and virus may be the cause. Most common organisms isolated are streptococcus hemolyticus and staphyloccus aureus. Sometimes pneumococcus, gram negative bacteria, rarely candida, pneumocystis and cytomegalovirus may be the cause. Spread of infection occurs via haematogenous, by lymphatic route, penetrating injury to the neck and by pyriform sinus fistula. It occurs following URI, septicaemia, in immune compromised patients and debilitated individuals. Recurrent cases of acute suppurative thyroiditis occur mainly due to persistent pyriform sinus fistula.

A patient with acute thyroiditis turning into abscess

Patients usually present with neck pain radiating to jaw, fever, chills, odynophagia and dysphonia. Infections will cause neutrophilic infiltration and tissue necrosis, sometimes evolve into abscess. Diagnosis

is made by FNAC. Treatment is usually medical, includes IV antibiotics, analgesics and symptomatic management. Thyroid abscess requires drainage, pyriform sinus fistula best treated by fistulectomy.

GRANULOMATOUS THYROIDITIS:

It is also known as De Quervains thyroiditis and sub acute thyroiditis. It usually occurs in middle aged women following upper respiratory tract viral infection. It has been suggested that the post viral inflammatory response is the cause for this condition. It is strongly associated with HLA B 35 haplotype.

Patients usually present with sudden or gradual onset of neck pain radiating to mandible and ear. The gland is enlarged, firm and tender. In contrast to Riedel's thyroiditis there will not be adherence to adjacent structures. Most of the patients initially have hyperthyroid phase, then hypothyroid phase and finally euthyroid phase. Microscopically, areas of inflammation with non-caseating granulomas, containing foreign body giant cells that characteristically surround the follicles are seen. ESR will be more than 100mm/hr.

Medical treatment with NSAIDs and in severe cases steroids will be sufficient. Thyroidectomy is rarely indicated and is restricted to patients with recurrent disease and not responsive to medical treatment.

SUBACUTE PAINLESS THYROIDITIS:

It occurs between 30-60 years of age, either sporadically or in post partum period. It is thought to be an auto immune disease. Patients have normal or mildly enlarged, firm, non tender thyroid gland. Patients have normal ESR in contrast to painful thyroiditis. Patients are usually symptomatically managed with thyroxine or beta blocker. Thyroidectomy is rarely indicated, only in patients with recurrent and disabling episodes.

OTHER GRANULOMATOUS INFLAMMATIONS:

Palpation thyroiditis(Multifocal Granulomatous Folliculitis):

It is a common incidental finding noted during histopathological examination. It is thought to be caused by minor trauma to the gland or vigorous palpation on physical examination. It is clinically insignificant and grossly inconspicuous thyroid process. Microscopically, collections of histiocytes, lymphocytes and multinucleated giant cells are noted in the lumen of thyroid follicles.

TUBERCULOSIS:

It rarely occurs as a primary clinical manifestation within the thyroid. It commonly occurs in disseminated miliary tuberculosis to form a tubercle within the gland. Sometimes, tuberculosis of cervical lymphnodes or larynx may involve thyroid gland secondarily. Patients

usually present with painless enlargement of thyroid. Diagnosis is confirmed by HPE.

SARCOIDOSIS:

It can involve thyroid gland to form multiple interstitial non-caseating granulomas. Usually it occurs in patients with systemic disease. Diagnosis is confirmed by HPE.

MYCOSIS:

It is a very rare condition occurring in immuno-compromised patients with disseminated fungal infections. Most common organism causing this condition is Aspergillus. Histoplasma, Candida, Nocardia can also cause mycosis of thyroid. Microscopically, it is characterised by acute inflammation and necrosis and sometimes abscess formation.

HASHIMOTO'S THYROIDITIS:

It is the common cause of hypothyroidism in non iodine deficient areas and the most common inflammatory disorder that affects thyroid gland. It commonly affects females (F:M-15:1), occurs in the 4^{th} and 5^{th} decade. It was initially described by Hashimoto in 1912 as "STRUMA LYMPHOMATOSA" – transformation of thyroid tissue into lymphoid tissue. It is an auto-immune disease due to the production of antibodies against Thyroid Peroxidase(>90%), Thyroglobulin(60%), TSH-R(60%),

NaI symporter(20-25%). Follicular epithelial cell damage is mediated by both humoral and cell mediated immunity. It is also has been associated with increased intake of iodine and long term intake of drugs such as amiodarone, lithium and interferon alpha. It has been suggested that genetic predisposition also plays a role.

Clinically, the gland is diffusely enlarged, painless and firm. Sometimes patients may present with multinodularity, pressure symptoms, hypothyroidism and occasionally hyperthyroidism(<5%). Initially there may be hyperthyroid features but ultimately all the patients land up with hypothyroidism.

Microscopically it is characterised by atrophied thyroid follicles, lymphocytic infiltration of the stroma and extensive oncocytic change of follicular cells. Fibrous variant of Hashimoto's thyroiditis is usually confused with carcinoma and Riedel's thyroiditis, characterised by very firm goiter, severe pressure symptoms and physical signs suggestive of cancer. Hashimoto's thyroiditis, along with lymphocytic infiltration of adrenal gland and other organ is known as 'Schmidt's syndrome'.

Elevated TSH and the presence of antithyroid antibodies confirms the diagnosis. FNAC is done in patients with nodularity and rapidly enlarging goitre. Treatment includes Thyroxine in hypothyroid patients and in euthyroid patients to shrink the large goitre. Surgery may be

occasionally needed for patients with pressure symptoms, cosmetic deformity and suspicion of malignancy.

Complications include high risk of developing Lymphoma(around 80 fold) , Leukemia, Papillary Carcinoma, Hurthle cell neoplasms.

LYMPHOCYTIC THYROIDITIS:

Lymphocytic thyroiditis and Hashimoto's thyroiditis represent different phases of an organ specific autoimmune disorder, characterised by production of auto antibodies that affect thyroid function. Lymphocytic thyroiditis has been more commonly diagnosed in children. Diagnosis is made through FNAC. Usually patients present with asymptomatic goiter of short duration. Thyroid gland is diffusely enlarged, firm with vague nodularity. Microscopically, lymphocytic nodules with germinal centers are seen scattered in the interstitium. Clinical course mimics Hashimoto's thyroiditis. Surgery may be indicated in patients with pressure symptoms, rapidly enlarging goiter and suspicion of malignancy.

REIDEL'S THYROIDITIS:

It is an extremely rare form of thyroiditis that typically affects elderly females. It is also known as Invasive thyroiditis, Fibrous thyroiditis and Reidel Struma. Etiology is not clearly known. It is

associated with some auto immune diseases and may represent a manifestation of the group of idiopathic disorders known as 'Inflammatory Fibrosclerosis' , that is associated with mediastinal, retro peritoneal and retro-orbital fibrosis and sclerosing cholangitis.

It may affect part or whole of a thyroid gland. When the whole gland is involved, patient may be hypothyroid. Patients usually presents with hard irregular, painless mass in the neck with respiratory difficulty, swallowing difficulty and voice change. Clinically, the mass will be very hard and fixed to the adjacent tissues. Diagnosis is confirmed by open biopsy that shows extensive fibrosis of the affected gland that extends beyond the capsule to the adjacent soft tissue.

Some patients may show response to corticosteroids and tamoxifene. Most patients need surgery to decompress trachea by wedge resection of the gland and to rule out the presence of malignancy. Complete thryoidectomy is very difficult to achieve due to the obliteration of tissue planes by fibrous infiltration.

GRAVE'S DISEASE:

It was first described by Robert Grave in 1835. He initially described long and continuous palpitations in three young females and palpitations with eye signs in one young female. Grave's disease is

characterised by a triad of Diffusely enlarged thyroid gland, Hyperthyroidism and Ophthalmopathy. It is an autoimmune disease and has strong familial predilection. Female to male ratio is 5:1. Common age group is between 30-60years. Postpartum state, iodine excess, lithium therapy, bacterial and viral infections are suggested as possible stimulating factors for autoimmunity. Grave's disease may also be associated with autoimmune diseases like Type 1 DM, Myasthenia Gravis, Addison disease, Pernicious anemia.

Autoimmunity cause production of Thyroid Stimulating Immunoglobulins(TSI) that binds to TSH receptor and produce long standing continuous stimulus to thyroid follicle cells causing increased rate of growth and excess synthesis of thyroid hormones. Clinically, patients will have heat intolerance, loss of weight inspite of good appetite, increased thirst and sweating, palpitations, diarrhoea, decreased sleep, tremors, amenorrhoea etc. Long standing cases may develop atrial fibrillation and high output cardiac failures.

Patients will have smooth, diffusely enlarged, non tender gland with increased blood supply evidenced by bruit, moist and warm skin. Widening of pulse pressure occurs due to cutaneous vasodilation. Fine tremors, proximal muscle weakness, muscle wasting and hyperactive tendon reflexes may also be present. Around 50% of patients with

Grave's disease will have eye signs including lid lag, widened palpebral fissure, proptosis, ophthalmoplegia etc. Less than 2% of patients will have thyroid dermopathy.

Serum T3, T4 levels will be elevated, while TSH levels will be decreased. Elevated TSH-R Ab is diagnostic. 123 iodine uptake scan shows diffuse uniform uptake. Microscopically, the gland is hyperplastic containing tall columnar epithelial cells with scanty pale staining colloid and increased vascularity. Lymphocytic infiltration and aggregation may be present. Treatment includes antithyroid drugs, radioactive iodine ablation and thyroidectomy. Choice of treatment depends on several factors and individual preferences.

DIFFUSE GOITER:

The enlargement of thyroid is called as goiter. It may be toxic or non toxic and can be endemic and sporadic. Diffuse goiter and MNG are most often caused by impaired thyroid hormone synthesis, due to iodine deficiency. The compensatory rise in TSH will cause hypertrophy and hyperplasia of follicular epithelial cells and enlargement of thyroid.

Endemic goiter can also be caused by ingestion of goiterogens (excessive calcium, cabbage, cauliflower, cassava and turnips). Sporadic goiter occurs most commonly in females at the time of puberty or in

young life and goiterogens, hereditary enzyme deficiencies may be the cause.

Clinically the gland is diffusely enlarged, soft in consistency. Patients usually will be in euthyroid state. Microscopically follicles lined with hyperplastic, tall columnar epithelium - 'Parenchymatous goiter'. If iodine is available in adequate quantity or the demand of thyroid hormone synthesis decreases the follicular epithelium involutes and form colloid rich follicles-'colloid goiter'. The cut surface of the gland appears glassy and translucent. The follicular epithelium is flattened and cuboidal with abundant colloid.

NODULAR GOITER:

Due to repeated episodes of hyperplasia and involution in untreated colloid goiter, irregular enlargement of gland occurs and is called as multinodular goiter. Usually MNG occurs in older individuals than colloid goiter. It occurs due to variations among follicular cells in response to various external stimuli. Both polyclonal and monoclonal nodules can coexist within the same MNG. Some longstanding MNG will develop into autonomous nodules that secrete thyroxine without TSH stimuli-'Toxic MNG'.

Patients usually present with asymmetrically enlarged thyroid gland with pressure symptoms, often in euthyroid state. Sometimes they may grow behind the sternum – 'Intrathoracic or Plunging goiter'. Minority of patients may present with toxic symptoms. Sudden enlargement of the thyroid nodules happen sometimes due to haemorrhage. TFT will be normal. RAI scan shows patchy uptake with areas of hot and cold nodules. Incidence of malignancy in MNG is 5-10%. Treatment involves suppression of TSH with thyroxine, thyroidectomy and radio iodine ablation.

Diffuse goiter

Multinodular goiter

FOLLICULAR ADENOMA:

Follicular adenomas of the thyroid are discrete, solitary masses resulting from clonal expansion of follicular cells due to gain of function (growth advantage) in TSH signalling system. For significant proportions of adenomas, etiology could not be identified. Clinically follicular adenomas are difficult to differentiate between other causes of nodular

thyroid enlargement. Most of them present as unilateral, asymptomatic, solitary nodular swelling. Majority of them are non functional. Few adenomas may produce thyroid hormones independent of TSH stimulation and are termed as toxic adenomas – 'Plummer's disease'.

Microscopically they have increased number of uniform appearing follicles, that contain colloid. The entire lesion is covered by well defined capsule with compression of adjacent thyroid tissue. FNAC cannot distinguish between follicular adenoma and carcinoma. Variants of follicular adenoma include colloid adenoma, atypical follicular adenoma, hurthle cell adenoma. Most of the adenomas take up less Radio active Iodine than normal thyroid parenchyma. About 10% of cold nodules eventually prove to be malignant on histologic analysis. Treatment includes thyroidectomy to rule out the presence of malignancy.

THYROID MALIGNANCIES[3,4,5,6,7,8]

They account for less than 2% of all cancers. Most of the thyroid cancers occur in adults, but papillary carcinoma may occur at young age. Female sex is most frequently affected, particularly in early and middle adult age group. This may be related to neoplastic thyroid epithelium expressing oestrogen receptors. Carcinomas in childhood and late adult life have equal sex distribution. Even though most of the thyroid malignancies arise from thyroid follicular epithelium, each variant has different clinical and biological features.

There are various factors including genetic and environmental factors implicated in the pathogenesis of thyroid malignancies. Genetic factors play a main role in pathogenesis of Medullary thyroid cancer(MTC). Familial papillary and follicular carcinomas are very rare. Various gene mutations are involved in the histologic variants of thyroid malignancies.

a. Follicular Carcinoma – Mutation in RAS family oncogenes and PAX 8-PPAR fusion gene.

b. Papillary Carcinoma – Rearrangement of RET or NTRK1, mutations in BRAF oncogenes, RAS mutation.

c. Medullary Carcinoma – Mutations in RET protooncogene.

d. Anaplastic Carcinoma – Point mutation in p53.

Ionising radiation is a major predisposing factor for developing thyroid cancer especially when exposure occurs younger than 20 years. Upto 9% of people exposed to radiation in head and neck will develop thyroid malignancies after many decades of exposure.

Longstanding MNG has also been implicated as a risk factor in developing malignancy. Iodine deficient areas have higher prevalence of follicular carcinoma. Most of the thyroid lymphomas arise from the pre existing Hashimoto's thyroiditis.

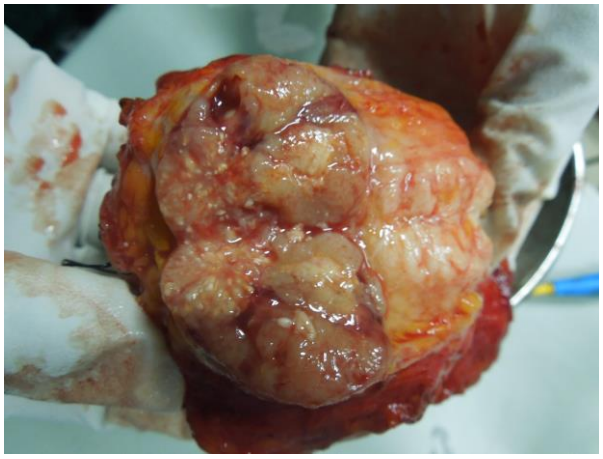
PAPILLARY CARCINOMA:

It accounts for 75-80% of all thyroid malignancies in iodine sufficient areas. It is the most common thyroid malignancy that occurs in adults with history of childhood radiation and in children. Female to male ratio is 2:1. Common age of presentation is 30-40 years.

A case of Pap ca Anterior view

Most patients present with painless, enlarged hard mass in the thyroid region. They are usually euthyroid. Sometimes the initial presentation may be an enlarged neck node – "Lateral aberrant thyroid". Dyspnoea, dysphagia and change in voice usually develop in locally infiltrative disease. Most common mode of spread is lymphatic spread. Hematogenous spread occurs in very few persons. Distant metastasis is seen in 20% of patients and common sites include lungs, bone, liver and brain.

FNAC is diagnostic. USG neck is mandatory to rule out the presence of neck nodes. On cut section, grossly the tumour may contain areas of calcification, necrosis and cystic change. Microscopically, the tumour may contain papillary projections. Cells are cuboidal and containing pale abundant cytoplasm with intranuclear grooves. The nuclei contain finely dispersed chromatin, which produces optically clear or empty appearance-'ORPHAN ANNIE EYED NUCLEI'.



Cut section showing microcalcifications of papillary carcinoma

Diagnosis of papillary cancer is mainly based on these nuclear features. Microscopic calcified deposits-'PSAMMOMA BODIES' may also be present. Multifocal lesions are identified upto 85% of specimens undergoing microscopic examination.

Variants of papillary carcinoma include encapsulated, tall cell, clear cell, follicular, insular, hyalinising trabecular and diffuse sclerosing type. They represent less than 1% of all papillary carcinoma and carry poor prognosis.

Patients with papillary carcinoma generally have excellent prognosis with ten year survival rate more than 95%. There are several scoring systems that include various factors as prognostic indicators. But the limitation is that the scoring system depends also on post operative HPE findings. Some of the scoring systems are

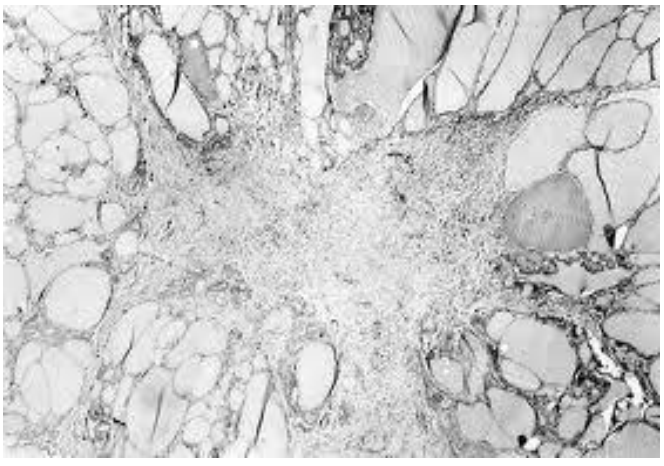
a. AGES
b. MACIS
c. AMES
d. Simplified system of De Groot and associates.
e. TNM

Of these, the widely followed one is the TNM staging system. In general age greater than 40 years, extra thyroidal invasion, distant

metastasis, poorly differentiated tumour are associated with poor prognosis. Treatment of choice is total or near-total thyroidectomy with functional or modified neck dissection followed by radio active iodine ablation for ablating micrometastasis.

PAPILLARY MICRO CARCINOMA:

They are defined as papillary carcinoma less than 1 cm in size with no capsular or blood vessel invasion and without lymphnode metastasis. Clinically they are undetectable. They are usually detected by HPE following thyroidectomy for benign conditions. Their incidence following surgery is varying from 4-14% in studies conducted in various parts of the world. Studies from autopsies have shown the incidence of occult papillary carcinoma ranging from 2-36%.



Papillary microcarcinoma, typical stellate scar like appearance.

Generally occult papillary carcinoma is associated with very good prognosis. When occult papillary thyroid carcinoma diagnosed following lobectomy or isthumectomy for some benign conditions, completion thyroidectomy is not mandatory, unless the tumour has evidence of angioinvasion, multifocality, positive margins or high grade tumour.

FOLLICULAR CARCINOMA:

Follicular carcinoma constitutes 10-15% of all thyroid malignancies. Their prevalence is more in iodine deficient areas than in iodine sufficient areas. Female to male ratio is 3:1. Mean age of presentation is around 50 years. They usually present as slow growing painless solitary nodule. Patients are generally euthyroid. Occasionally they may present in patients with longstanding goiter. Less than 1% of follicular carcinoma may present with features of thyrotoxicosis due to hyperfunctioning malignancies. Principal route of metastasis is haematogenous. Lymphatic metastasis is rare.

Follicular Ca operated with skull metastases.

FNAC cannot differentiate between follicular adenoma and follicular carcinoma. Pre operative clinical diagnosis of malignancy is suspected in patients with large lesions(greater than 4cms) in older men. DNA micro array test having being developed for differentiating benign and malignant follicular thyroid tumours. The specific micro RNAs, miR-197 and miR-364 are upregulated in follicular carcinoma[3].

Microscopically follicular carcinomas are single lesions and most of them are surrounded by a capsule. Malignancy is identified by the presence of capsular and vascular invasion, mainly involves large vessels. Tumour thrombus may be present in jugular and middle thyroid veins. Patients with FNAC diagnosis of follicular neoplasm should undergo lobectomy since atleast 80% of patients have benign adenomas. Completion thyroidectomy should be performed in patients diagnosed as follicular carcinoma following lobectomy, so that radioactive ablation can be used to ablate metastasis.

The cumulative mortality rate for follicular carcinoma is around 15% in 10 years and 30% in 20years. Poor prognostic factors include age more than 50years, size more than 4cms, marked vascular and extrathyroidal invasion, high grade tumour and distant metastasis at the time of diagnosis.

MINIMALLY INVASIVE FOLLICULAR CARCINOMA:

Minimally invasive follicular carcinoma is less aggressive than widely invasive follicular carcinoma. It contains encapsulated lesions and have microscopic invasion through the capsule without extension into the normal glandular parenchyma . It may show invasion into small and medium sized vessels in the capsule or immediately outside the capsule, but not within the tumour. The role of completion thyroidectomy in minimally invasive follicular carcinoma is controversial. Larger the size, higher the grade. Older the age, one can proceed with completion thyroidectomy.

HURTHLE CELL CARCINOMA:

Even though it is a variant of follicular carcinoma, it differs from follicular carcinoma in many ways. They are often multifocal and bilateral, more likely to metastasize through lymphatics to local nodes. They are less amenable to radioactive ablation. They account less than 3% of all thyroid malignancies.

Hurthle cell carcinoma is also characterised by vascular and capsular invasion. Hence FNAC is not diagnostic. Microscopically, it is characterised by sheets of eosinophilic cells with abundant mitochondria that are devived from oxyphilic cells of thyroid gland. Lobectomy and

isthumectomy is adequate for hurthle cell adenoma. If it is confirmed as carcinoma by HPE, completion thyroidectomy along with central compartment node dissection is routinely performed. If needed MRND should be performed. Radioactive iodine ablation is not very effective in treating this tumour.

MEDULLARY CARCINOMA THYROID:

It arises from the parafollicular cells or 'C' cells of the thyroid, that are concentrated in the superolateral portions of the thyroid lobes and secrete calcitonin. MTC accounts for 5-10% of all thyroid malignancies. Most of the MTC occurs sporadically. Around 25% of MTC occur as inhertited syndromes that include Familial Medullary Thyroid Carcinoma, MEN 2A and MEN 2B. Female to male ratio is 1.5:1. Most common age of presentation is 50-60 years.

Familial cases present in children and in younger age group. Patients usually present with enlarged neck mass with mild pain. There may be associated cervical lymphadenopathy. Locally invasive disease may produce dyspnoea, dysphagia and dysphonia. In addition to Calcitonin MTC secretes CEA, prostaglandins, serotonin and rarely ACTH. Patients with extensive metastatic disease may present with diarrhoea and electrolyte imbalance.

MTC is usually unilateral in presentation in sporadic cases. In familial cases, it involves both lobes with features of multifocality. Microscopically, the tumour is composed of sheets of infiltrating neoplastic cells separated by collagen and amyloid. Immunohistochemistry for calcitonin is used as diagnostic tumour marker. All patients diagnosed as MTC should undergo screening for RET point mutations, pheochromocytoma and hyperparathyroidism.

In patients with pheochromocytoma and MTC, pheochromocytoma should be operated first. Total thyroidectomy and bilateral central compartment neck dissection is the treatment of choice for tumours less than 1cm confined to thyroid and without cervical node involvement. Tumors greater than 1cm, palpable neck nodes should undergo MRND. Chemotherapy and radioactive iodine ablation are not effective. External beam radiotherapy is reserved for unresectable residual and recurrent tumours. Annual measurements of calcitonin and CEA are done for routine follow up.

Stage is an important prognostic factor. Patients with tumour confined to thyroid will have 80% ten year survival rate whereas patients with node involvement has 45% ten year survival rate. Best prognosis is in patients with non-MEN familial MTC and worst prognosis is for MEN 2B.

ANAPLASTIC CARCINOMA:

This is an undifferentiated cancer arising from the thyroid epithelium. It is the most aggressive thyroid malignancy with 100% mortality within 6months to 1year of diagnosis. Females are most commonly affected. The common age group is 60-80 years. Patients usually present with rapid enlargement of a long standing goiter. It may be fixed to adjacent structures or overlying skin may be ulcerated. Compressive symptoms such as dyspnoea, dysphagia, hoarseness of voice are common. Both lymphatic and haematogenous metastasis can occur and they are usually present at the time of diagnosis.

It has been documented that around 50% of anaplastic carcinomas arise from the long standing MNG and 25% of patients with this tumour have a history of differentiated thyroid cancer(mostly papillary). 20-30% of patients have synchronous differentiated thyroid cancers.

FNAC is diagnostic. Sometimes incision biopsy may be needed to confirm the diagnosis. Microscopically, sheets of cells with marked heterogeneity are seen. Cells may be giant and multi nucleated, spindle shaped, polygonal, small cells. There is no satisfactory treatment regime for patients with anaplastic cancer. Sometimes isthumectomy and tracheostomy may be needed to alleviate the airway obstruction. Younger

patients who are undergoing thyroidectomy for resectable mass may have improved survival. Adjuvant chemotherapy and combined radiation may also provide some survival advantage in these patients.

LYMPHOMA:

Lymphomas constitute less than 1% of all thyroid malignancies. They usually arise from the patients with pre existing chronic lymphocytic thyroiditis and may arise as a part of generalised lymphomas. Patients usually have symptoms similar to anaplastic cancer, but the rapid enlargement of neck mass will not produce pain. Some patients may present with acute respiratory distress. Core needle biopsy or open biopsy is needed for the definitive diagnosis. Patients with extra thyroidal disease wil have poor prognosis.

Thyroid lymphoma usually respond well to combined chemotherapy and radiotherapy. Cyclophosphamide, Adriamycin, Vincristine, Prednisolone is the commonly used regimen. Patients with respiratory obstruction who do not rapidly get relieved by chemo and radiotherapy needs surgical resection of the enlarged thyroid and lymphnodes to relieve the obstruction. The overall five year survival rate is around 50% .

SQUAMOUS CELL CARCINOMA:

Pure squamous cell carcinomas are exceptional in thyroid. Squamous cells may be found in thyroid as a result of persistent thyroglossal duct and structures derived from the pharyngeal pouch. Expression of squamous metaplasia may occur in Hashimoto's thyroiditis and papillary cancer. Tall cell variant of papillary carcinoma has a tendency to evolve into spindle cell type of squamous cell carcinoma. In the presence of pure squamous cell carcinoma, the possibility of secondary extension from the tumors of larynx, trachea or metastasis from other sites should be considered.

METASTATIC TUMOURS:

Majority of metastatic tumours in thyroid are squamous cell carcinomas. In 10% of patients dying of malignant tumours, blood borne metastasis to thyroid is noted during autopsy. The most common site of primary tumour is skin(melanoma-31%), followed by breast, kidney,lung. Most commonly they are solitary lesions. Metastasis to thyroid is usually not misunderstood as primary thyroid tumour except in metastasis from renal cell carcinoma where it can present even decades after removal of primary tumour. Metastatic neuroendocrine tumour of various types can metastasize to thyroid gland and simulate MTC.

TERATOMA:

Teratomas of thyroid usually occur infants and children. Most of them are benign and cystic. They can cause obstruction of the airway. Thyroid teratomas in adult are very rare and are mostly malignant.

OTHER MALIGNANCIES:

Plasmocytoma, Langerhan cell histiocytosis, Rosai-Dorfmann disease(sinus histiocytosis with massive lymphadenopathy) may involve thyroid as a part of systemic disease. Benign mesenchymal tumours like lipoma, hemangioma, lymphangioma, schwannoma, solitary fibrous tumour have also been reported. Sarcomas like fibrosarcoma, liposarcoma, leimyosarcoma, chondrosarcoma, osteosarcoma, peripheral nerve sheath tumour are also reported.

EVALUATION OF THYROID GLAND

THYROID FUNCTION TESTS[3,4,5,6,]:

SERUM TSH:

Measuring the level of serum TSH is the most important determinant of thyroid function. Normal TSH value is around 0.5-5μU/ml. It is usually measured through immunometric assay. Clinically euthyroid patient having normal TSH indicates a normally functioning thyroid gland. There is inverse relation between the levels of free T4 & TSH in serum. A high TSH level indicates that the thyroid gland is hypofunctional, because of a problem that is directly affecting the thyroid (primary hypothyroidism). If the TSH level is low, it indicates that the person is having an overactive thyroid that is producing too much thyroid hormone (hyperthyroidism). Sometimes a low TSH may result from the reduced function of pituitary gland (secondary hypothyroidism).

SERUM T4:

Thyroxine presents in blood in two forms,

1) protein bound form

2) free T4 – the biologically active form

It can be measured as total T4 & free T4 by radioimmunoassay. Total T4 levels indicate the output from thyroid gland. It is raised in hyperthyroid

conditions. It can also be raised in euthyroid patients with pregnancy, OCP use, hormone therapy, tamoxifen due to elevated levels of thyroid binding globulin (TBG). Similarly total T4 levels can be decreased, where TBG binding is reduced in conditions like nephrotic syndrome, androgen excess. Hence the measure of free T4 fraction is preferable than total T4, and tests to measure this are called the Free T4 (FT4) and the Free T4 Index (FT4I or FTI). It can be measured directly through radioimmunoassay or indirectly through T3 resin uptake study. Individuals with hyperthyroidism will have an elevated FT4 or FTI, whereas patients who have hypothyroidism will have a low level of FT4 or FTI. Combining the TSH test with the FT4 or FTI accurately determines the function of thyroid gland.

The finding of an elevated TSH and low FT4 or FTI indicates primary hypothyroidism due to disease in the thyroid gland. A low TSH and low FT4 or FTI indicates hypothyroidism due to a problem involving the pituitary gland. A low TSH with an elevated FT4 or FTI is found in individuals with hyperthyroidism.

SERUM T3:

Serum T3 is also present in both, protein bound and free form. They can be measured through radioimmunoassay. Serum T3 levels in normal thyroid conditions are more indicative of peripheral metabolism of thyroid hormone. Hence it is not suitable for general screening test. Free T3 tests are useful to diagnosis early hyperthyroidism or to determine the severity of the hyperthyroidism and to find out whether the patient is having T3 thyrotoxicosis. Patients who are hyperthyroid will have an elevated T3 level. T3 testing rarely is helpful in the hypothyroid patient, since it is the last test to become abnormal. Patients can be severely hypothyroid with a high TSH and low FT4 or FTI, but they have a normal T3 level.

HORMONES	NORMAL RANGE	UNITS
TSH	0.5 - 5.0	μU/ml
Total T4	55 – 150	nmol/L
Total T3	1.5 - 3.5	nmol/L
Free T4	12 – 28	pmol/L
Free T3	3 – 9	pmol/L

TRH EVALUATION:

This is used to evaluate TSH secretory function of anterior pituitary. TRH is administered intravenously(500μg) and TSH levels measured after 30 and 60 minutes. In a normal person, TSH level should be elevated at least 6μIU/ml from baseline. Failure to raise indicates pituitary cause of hypothyroidism (secondary).

THYROID ANTIBODIES:

Thyroid antibodies do not reveal thyroid function, but may indicate underlying etiology for thyroid dysfunction, usually autoimmune thyroid diseases. Thyroid antibodies include Anti-Tg, Anti- TPO and Thyroid stimulating immunoglobulin(TSI) . More than 95% of patients with autoimmune hypothyroidism and 80% of patients with Grave's disease will have Anti-TPO at high levels. TSI stimulate TSH receptor in Grave's disease. Its main use is to predict neonatal thyrotoxicosis due to high maternal levels of serum TSI in last trimester of pregnancy.

SERUM Tg LEVELS:

Serum Tg levels are increased in all types of thyrotoxicosis except Factitious thyrotoxicosis. Tg levels are increased in thyroiditis. The main use of measuring Tg is in the follow-up of thyroid cancer patients who underwent total thyroidectomy and radioablation. Tg levels should not be

detectable in follow-up and if there is measurable level of serum Tg, it indicates incomplete ablation or recurrence.

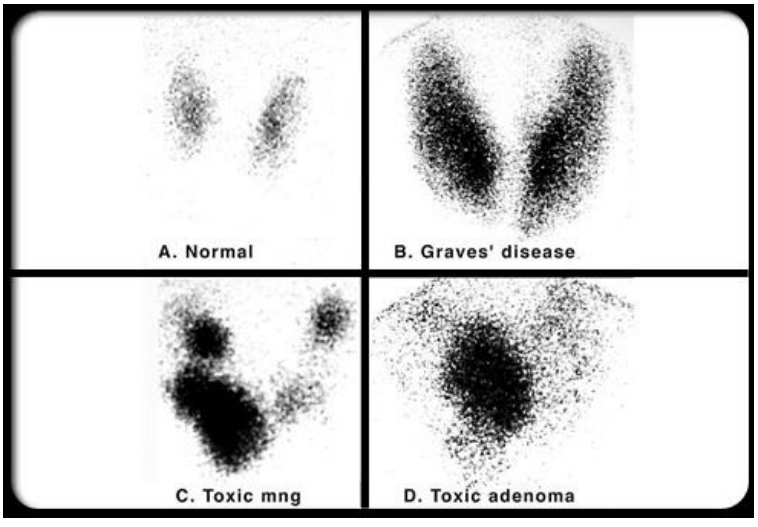
SERUM CALCITONIN:

It is secreted by parafollicular or C cells of thyroid. Its normal level is 0-4pg/mL. It is a sensitive marker for Medullary Carcinoma of thyroid(MTC).

THYROID IMAGING[3,4,5,6]:

RADIONUCLIDE SCANNING:

Radioisotopes I-123, I-125, I-131, 99mTc pertechnetate and 18-fluorodeoxyglucose are used in radionuclide scanning of thyroid. These are selectively transported into the thyroid gland allowing imaging and quantifying the uptake.



Thyroid radioiodine uptake scan- ^{123}I

I-123 has half life of 12-13 hours and emits low dose radiation. Hence it is used to image the lingual thyroid and goitres. Whereas I-131 has longer half life, around 8-10 days, and it is used to treat the patients having differentiated thyroid cancers with metastatic disease. 99mTc also having shorter half life, used for evaluation of thyroid gland. It is very sensitive in detecting nodal metastases. 18FDG-PET is more sensitive in detecting the metastases in thyroid carcinoma. It is particularly more effective in patients, in whom other types of radioimaging studies are negative.

In nuclear imaging, findings observed are as below,

1. Grave's disease – increased, homogenous tracer uptake with enlarged gland
2. Toxic adenoma – focal area of increased tracer uptake, with reduced uptake in rest of the gland.
3. Toxic MNG - enlarged gland, with distorted architecture, with multiple areas of relatively increased or decreased tracer uptake.
4. Sub acute thyroiditis – very low tracer uptake.
5. Thyrotoxicosis factitia – very low tracer uptake.

Thyroid radio nuclide imaging also used in follow-up of patients operated and radioablated for thyroid carcinoma. I-131 radioisotope is used for this purpose.

THYROID ULTRASOUND:

Ultrasound is a non invasive, easily accessible imaging modality. High-resolution (7-15 MHz) ultrasound is the most sensitive imaging modality available for examination of the thyroid gland. It can diagnose nodules >1mm.

It is useful to detect whether a swelling arises from the thyroid or from the adjacent structures, calculate their dimensions, multicentricity, differentiate between solid and cystic component, identify the internal structure and vascularization , evaluate diffuse changes in the thyroid parenchyma and to check for presence of associated neck nodes. It is also used in guided FNAC.

There are certain sonographic findings that are more consistent with malignancy. They include presence of microcalcifications, irregular thick walled cystic cavity, hypo echogenicity, increased vasculature. Presence of these findings are sonologic indications for FNAC.

Role of CT , MRI, FDG-PET:

CT&MRI provide very good imaging of thyroid gland and nodal involvement, especially in very large goiters with retrosternal extension. Their relationship with airway and involvement of vascular structures can be well studied. For patients undergoing radio iodine ablation plain CT

should be taken, if contrast CT is taken therapy should be delayed for several months.

Combined PET-CT has a limited role in diagnosis. It plays a vital role in post-surgical management of a patient with thyroid cancer. It has been recommended for,

1) patients with elevated serum thyroglobulin and negative radioiodine whole body scans post operatively
2) patients with adverse histology
3) patients with high risk disease
4) patients with histological diagnosis of Hurthle cell carcinoma
5) FDG-PET has also been advocated for post treatment response assessment.

THYROID FNAC[7,8]:

Fine-needle aspiration cytology (FNAC) of the thyroid has become the best test for preoperative evaluation of thyroid nodules. Thyroid FNAC has reduced the number of unnecessary thyroid surgeries and has increased the proportion of cancers found before surgery.

According to the nature of the thyroid nodule, FNAC can function as a diagnostic test or a triage tool. As a diagnostic test, FNAC can be used to diagnose papillary carcinoma, poorly differentiated carcinoma, medullary

carcinoma , anaplastic carcinoma, metastatic malignancy, thyroiditis, and most benign nodular goitres and cysts. Yet follicular adenoma, well-differentiated carcinoma and some hyper cellular goitres cannot be diagnosed through FNAC.

Indications:

-every patients with clinically palpable nodule should undergo FNAC.

-incidentalomas that are detected by USG should undergo FNAC, if there is any presence of sonographic features that are suggestive of malignant nodule.

-incidentalomas with PET scan avidity should undergo FNAC.

-diffusely enlarged thyroid

-unco-operative patients and patients with bleeding diathesis are contraindications for performing FNAC.

Procedure:

Before doing a FNAC, a complete history should be obtained; a thorough physical examination of the thyroid gland and cervical lymph nodes should be performed; and a serum thyroid stimulating hormone level (TSH) and if possible thyroid ultrasound (US) should be obtained.

After antiseptic preparation of the neck, a 25 or 27 gauge needle introduced into the nodule without suction force, either through palpation

guided or ultrasound guided. Multiples passes in various directions made within the nodule, using single skin prick. If it is cystic cavity, containing fluid, a wide bore needle is introduced to aspirate the fluid content. Again the nodule size is reassessed and FNAC is performed. Contents are spilled into slides, air dried, stained and examined. Thyroid FNAC diagnostic criterias include,

1) Nodular goiter/colloid nodule: plenty of colloid with an adequate number of benign follicular cells.

2) Adenomatoid nodule: more cellular and less colloid than colloid nodule, no cytologic atypia present.

3) Hashimoto's/Lymphocytic thyroiditis:in addition to the presence of benign follicular cells, abundant reactive lymphoid cells are present in the background.

4) Suspicious for malignancy: Nuclear features and cellular arrangements are suggestive of a specific type of malignant tumor; however, a definite diagnosis cannot be made out due to inadequate cellularity.

5) Malignant: Cellular features are diagnostic of a specific thyroid cancer, lymphoma, sarcoma, etc.

6) Atypical: Nuclear atypia such as nuclear enlargement, nuclear grooves, nuclear pseudo-inclusions, and prominent nucleoli are present

focally in a few clusters of follicular cells, but the rest of the smear is otherwise consistent with nodular goiter or thyroiditis.

Atypical lymphoid cells present in a background of Hashimoto's thyroiditis, which cannot be distinguished between lymphoma and reactive lymphoid hyperplasia.

7) Follicular neoplasm: Cellular specimens with scant or absent colloid, consisting of many syncytial sheets or microfollicles with enlarged nuclei, coarse chromatin, and prominent nucleoli.

8) Follicular lesion: Cytologic smears from different passes of the FNAC show a spectrum of cytologic features, ranging from a benign nodular goiter to a possible follicular neoplasm.

9) Inadequate: Insufficient number of follicular cells (8–10 clusters on two slides) in specimens with scant or absent colloid.

The Bethesda System for Reporting Thyroid Cytopathology:

For clarity of communication, the Bethesda System for Reporting Thyroid Cytopathology recommends that each report begin with a general diagnostic category. Each of the categories has an implied cancer risk that links it to a rational clinical management guideline. Recommended Diagnostic Categories include, I- non diagnostic, II- b benign, III-

atypia/follicular lesion of undetermined significance, IV- follicular neoplasm, V- suspicious for malignancy, VI- malignancy.

Implied Risk of Malignancy and Recommended Clinical Management

Category	Risk of malignancy %	Usual management
I	1-4	Rpt FNAC with USG guidance
II	0-3	Clinical follow up
III	5-15	Repeat FNAC
IV	15-30	Lobectomy
V	60-75	Near total thyroidectomy or lobectomy
VI	97-99	Near total thyroidectomy

TREATMENT OPTIONS

MEDICAL THERAPY[3,4,5,6]:

Antithyroid drugs such as Propylthiouracil, methimazole, carbimazole acts by binding to thyroid peroxidase and thereby inhibit the iodination of tyrosine residues in thyroglobulin and coupling of iodotyrosine residues In addition propylthiouracil also inhibits peripheral conversion of T4 to T3. They are used in the treatment of hyperthyroidism that occurs in Graves disease, toxic MNG and thyroid storm. Propanolol is the drug used for controlling sympathetic symptoms in hyperthyroidism.

Thyroxine tablet of 100-150 μgs used for hypothyroidism. They are also used to shrink the goiter size and in block and replacement therapy.

RADIOACTIVE IODINE ABLATION THERAPHY[3,4,5,6]:

Affinity of the hyperplastic thyroid gland to iodine forms the basis of RAI ablation. I-131 is most commonly used, administered orally. Usual therapeutic dose is 8 to 12 mc. When taken up by the gland, RAI disintegrates within the gland and emits beta particles which destroy the acinar cells. Since beta particles penetrate only few millimeters, surrounding normal tissues are not affected.

Before ablation a preliminary isotope scan is done to assess the size of the gland. All patients should be made euthyroid before treatment.

Also antithyroid drugs should be stopped 2-3 weeks before therapy to facilitate iodine uptake by the gland. Response to therapy is usually slow takes 8-12 weeks.

Indications:

1. Older patients with small or medium sized goiter.
2. When surgery or antithyroid drugs are contraindicated.
3. Following relapse after surgery or medical treatment.

Absolute contraindications: Pregnancy and Lactation.

Relative contraindications: Ophthalmopathy, young patients and presence of thyroid nodules.

Complications:

IMMEDIATE	LATE
1. Neck pain, swelling, tenderness 2. Nausea and vomiting 3. Thyroiditis 4. Sialadenitis	1. Bone marrow suppression 2. Increased incidence of Leukaemia, thyroid and other malignancies 3. Chronic sialadenitis, nodules 4. Worsening of ophthalmopathy 5. Hypothyroidism and hypoparathyroidism 6. Infertility and abortion

SURGICAL MANAGEMENT[3,4,5,6,32]:

Pre-operative planning:

As with any surgery, a detailed discussion with the patient is to be made about the indications, alternate treatment options and possible complications following thyroidectomy. Complications include injury to recurrent laryngeal nerve, resulting in hoarse voice, post-operative hypoparathyroidism leading to transient hypocalcaemia(10-20%) and even permanent hypocalcaemia(1-2%), injury to cervical sympathetic trunk(in invasive thyroid cancers and retro esophageal goiters) resulting in Horner's syndrome and very rarely bilateral vocal cord dysfunction with airway compromise requiring tracheostomy. Patients should be aware that after subtotal and total thyroidectomy, they will be required to take lifelong thyroid hormone replacement. After the detailed discussion, informed consent for surgery is obtained.

Pre-operative evaluation:

Apart from basic investigations for anaesthetic fitness, all patients should be evaluated with thyroid function test, serum calcium and parathormone level. Further patients with any recent or even remote history of hoarseness of voice and those with history of previous neck

surgery should undergo vocal cord assessment with direct or indirect laryngoscopy.

Pre-operative management:

It is essential that a patient is in euthyroid state prior to surgery to avoid the risk of developing a thyroid storm during surgery. This is usually achieved in 6 weeks using antithyroid drugs like propylthiouracil 100 to 300 mg thrice daily or methimazole 10-30 mg thrice daily. Propranolol 40 to 120 mg thrice or four times a day is used to control symptoms like tachycardia, anxiety, tremors and heat tolerance. Potassium iodide1 drop or Lugol's iodine solution 5 to 10 drops twice or thrice a day is given for 14 days before surgery to decrease the vascularity of the gland and thereby facilitating surgery.

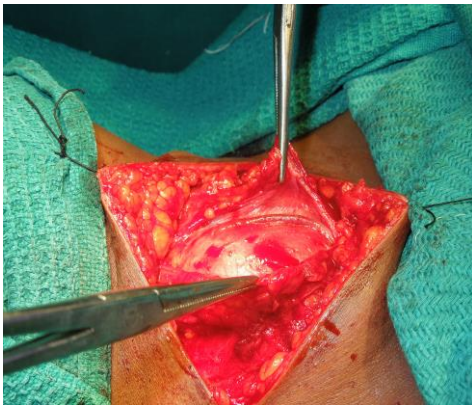
Surgical technique:

General anaesthesia is always preferred. Patient is positioned supine, with a sandbag between the scapulae, neck well extended and head placed on a head ring. Hyperextension is to be avoided. Correct positioning ensures that the isthmus of thyroid lies over second and third tracheal rings just caudal to the cricoids cartilage and will allow good exposure and access to the surgeon.

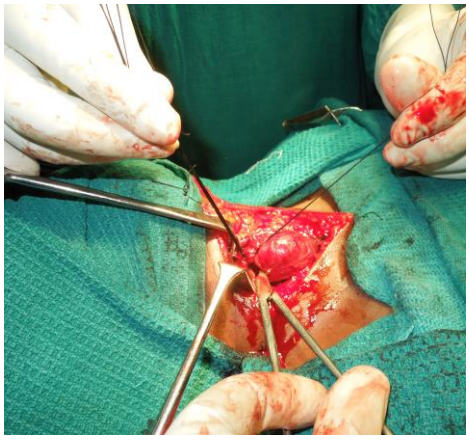
HEMITHYROIDECTOMY:

The skin incision is placed 1 cm below the cricoid cartilage, along the Langer's lines. The incision should be centrally placed and should be neither too low nor too high. The incision is deepened up to the platysma, where an avascular plane is reached. Blunt dissection is performed in this plane superiorly and inferiorly and flaps raised.

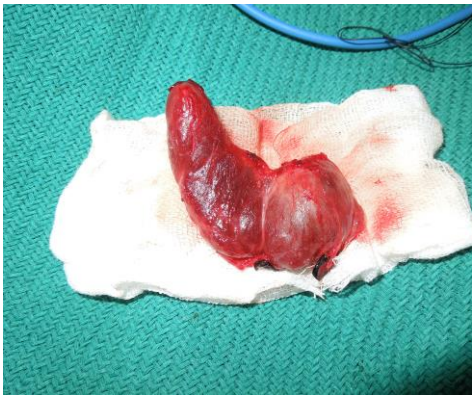
Positioning and marking the incision



Flaps raised & deep fascia opened



Ligating the syperior pedicle



Hemithyroidectomy specimen

The strap muscles are separated using electro cautery after dividing the cervical fascia in the midline. Ipsilateral strap muscles are retracted and blunt dissection performed between them and the gland. Once the thyroid lobe is exposed, superior pole vessels are mobilized and ligated close to the gland to avoid injury to superior laryngeal nerve. After mobilization of upper pole, remaining lobe is retracted antero-medially and blunt dissected laterally. The middle thyroid vein is ligated and divided and the lobe is delivered out of the wound. Recurrent laryngeal nerve and parathyroid glands are identified. The inferior thyroid vessels are identified and ligated away from the gland to avoid damage to the recurrent laryngeal nerves. Care should be taken to divide only the terminal branches entering the gland as inferior pole vessels also supply the inferior parathyroids.

The final dissection off the anterolateral aspect of the trachea through the ligament of Berry is performed and thyroid isthmus is mobilized up to the intersection with contralateral lobe, and then divided. Specimen is re-examined to ensure no parathyroid is inadvertently removed. Strap muscles are reapproximated followed by rest of the wound.

SUBTOTAL THYROIDECTOMY:

The recommended resection for subtotal thyroidectomy involves removal of total lobectomy and isthumectomy on the most diseased side and a subtotal resection leaving 4g of tissue on the contralateral side.

A thyroid lobectomy is performed on the diseased side as described before. On the side of subtotal resection, the upper pole vessels and middle thyroid vein are divided. However the branches of inferior thyroid artery are not ligated and a postero-lateral resection margin through the thyroid is made, along which it is transected. Keeping the posterior thyroid capsule intact helps to protect the nearby recurrent laryngeal nerve and parathyroid glands.

NEAR-TOTAL THYROIDECTOMY:

Near-total thyroidectomy leaves less than 1 g (1 cm) of thyroid tissue on side of neck. It is performed when total thyroidectomy is planned but deemed unsafe to do in order to preserve recurrent laryngeal nerve or parathyroid gland.

Complications of surgery:

- Haemorrhage: A tension hematoma deep to cervical fascia may develop, due to slipping of ligature on superior thyroid artery.

- Respiratory obstruction: Due to laryngeal oedema or collapse/kinking of trachea and/or tension hematoma.
- Recurrent laryngeal nerve paralysis: Can be unilateral or bilateral, transient or permanent.
- Thyroid insufficiency: Usually seen within 2 years after surgery.
- Parathyroid insufficiency: This is due to inadvertent removal or infarction of parathyroids due to damage to parathyroid end artery. Most cases present 2-5 days after surgery.
- Wound infection
- Hypertrophic or keloid scar.
- Stitch granuloma.

MATERIALS AND METHODS

Study design : Prospective-observational study

Study period: September 2011-november 2012

Study place: Coimbatore government medical college hospital ,Coimbatore

Study population: A total number of 109 consecutive patients, who underwent some form of thyroid surgeries in all surgical units of our hospital. All these patients had clinically, radiologically and cytologically proven benign thyroid conditions. Patients with cytological report of follicular lesion were also included in the study.

Exclusion criteria:

1. Patients with age less than 12 years.
2. Patients having clinical, radiological and cytological evidence of malignancy.
3. Patients with enlarged cervical nodes with proven secondary deposits.
4. Patients with recurrent thyroid swelling.

For all patients written informed consent was obtained. Thorough history taking and clinical examination was done as per previously formed proforma case sheet.

History regarding residence, dietary intake, drug intake, duration of swelling and recent increase in size, symptoms of hyper/hypothyroidism, pressure symptoms, symptoms of metastases, radiation exposure, involvement in other family members were sought.

Physical examination to find out nodularity, fixity, presence of neck nodes, lung and skeletal metastases was done.

Each patient was subjected to ENT examination to document vocal mobility.

X –ray neck and chest were taken to look for tracheal compression, and to look for lung metastases.

Serum TSH, total T4, total T3 were estimated in all of the patients. For patients with normal TSH and abnormal total hormones free T3 and free T4 also estimated.

Each patient has undergone USG neck to look for clinically undetectable nodules, to look for suspicious lesions and neck nodes.

FNAC was done for each patient in the Department of pathology. For patients with multinodular goitre FNAC was perfomed in all dominant

nodules and non dominant nodules of >1cm size and radiologically suspicious nodules.

Two patients with retrosternal extension of goitre were subjected to CT thorax.

Radioisotope scan was not done, as that facility is not available in our hospital.

Baseline investigations include blood sugar, blood urea, serum creatinine, complete hemogram, blood grouping, VCTC , serum HbsAg, ECG taken for all patients. For patients >50 years and patients with features of hyperthyroidism, cardiologist opinion obtained regarding fitness for surgery.

All patients were admitted. Co existing problems, if present were corrected or controlled (toxic symptoms, anaemia, diabetes, hypertension) and prepared for surgery.

The criterias for selection of surgery include pressure symptoms, cosmesis, toxicity, suspicious of malignancy and individual preferences.

Per-operative findings for all patients were recorded. Specimen sent for HPE and histopathology reports were recorded. All patients were followed till discharge.

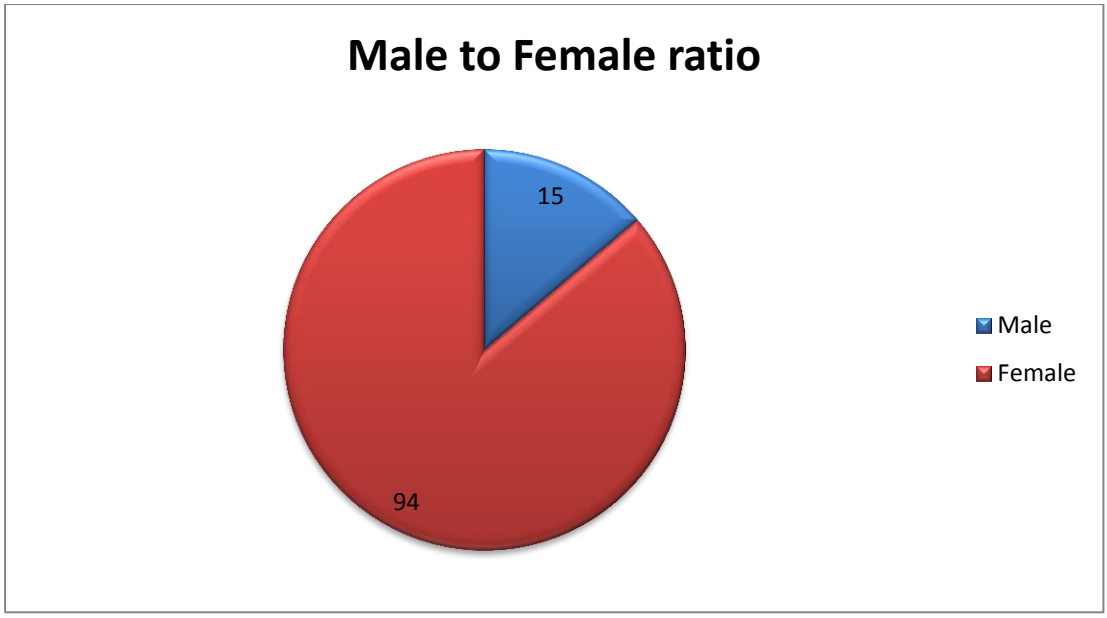
OBSERVATIONS

AGE AND SEX DISTRIBUTION FOR PATIENTS PRESENTED WITH BENIGN THYROID DISEASES:

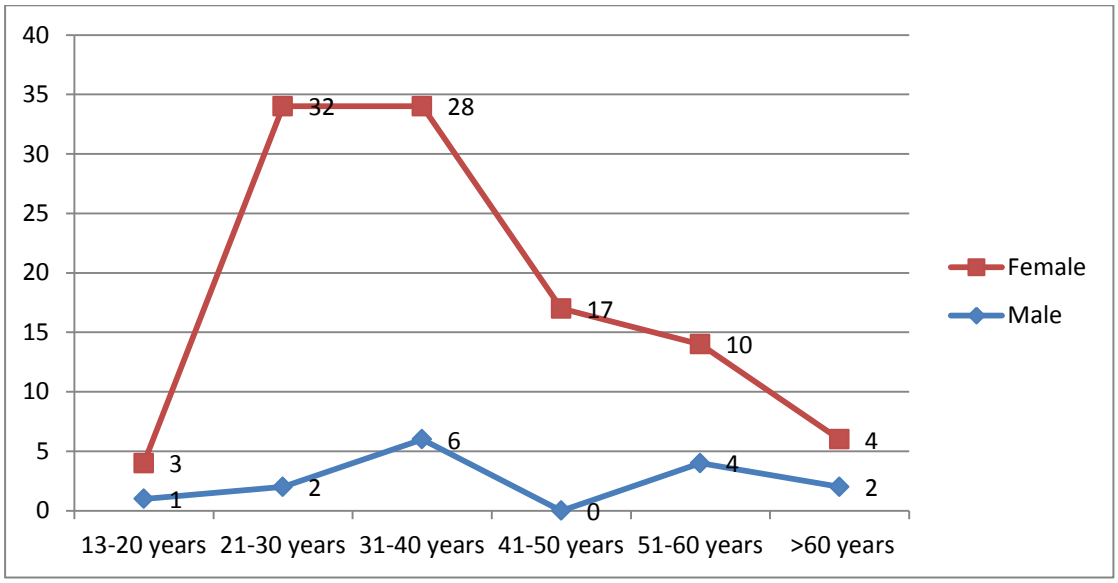
Of total 109 patients presented with benign thyroid diseases 94 patients were female and 15 patients were male. Most common age group of presentation for female is 20-40 years. The most common age group of presentation for male is 30-40 years.

AGE	MALE	FEMALE	TOTAL
13-20 years	1	3	4
21-30 years	2	32	34
31-40years	6	28	34
41-50 years	-	17	17
51-60 years	4	10	14
>60 years	2	4	6
TOTAL	15	94	109

Male to female ratio for patients underwent surgery for benign thyroid diseases is **1:6.3**

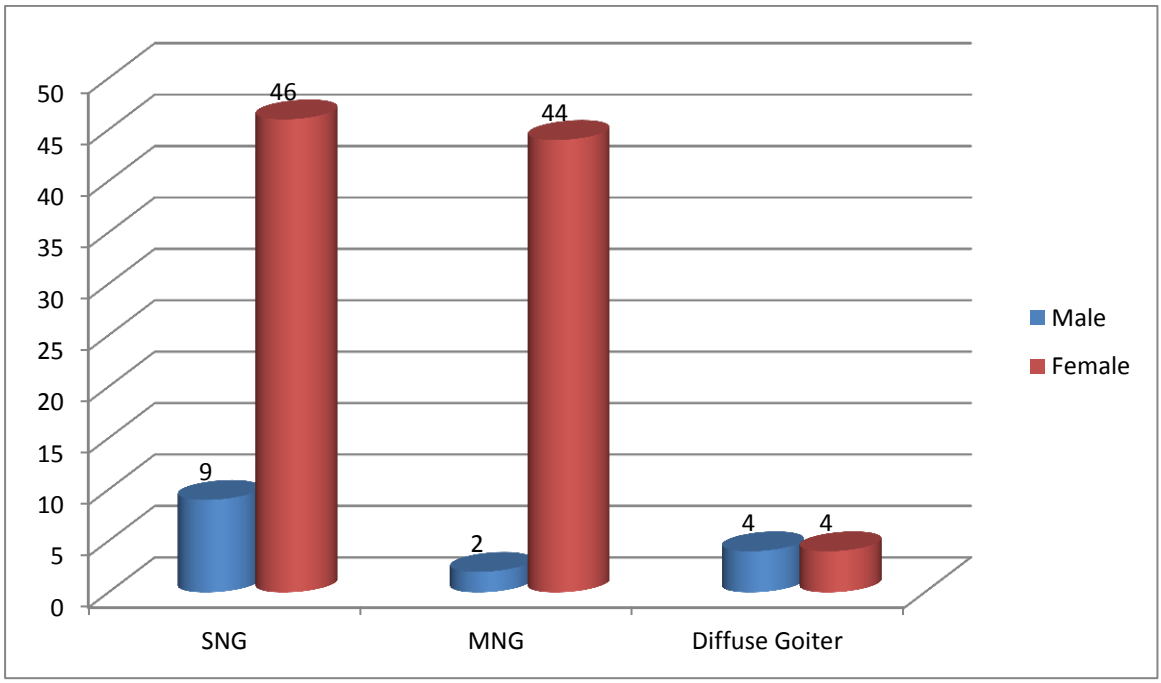


There is a rising trend after 20 years of age and falling trend following 40 years of age. Mean age for presentation of benign thyroid diseases is **38.4** years. Range of the age distribution is 17-88 years.



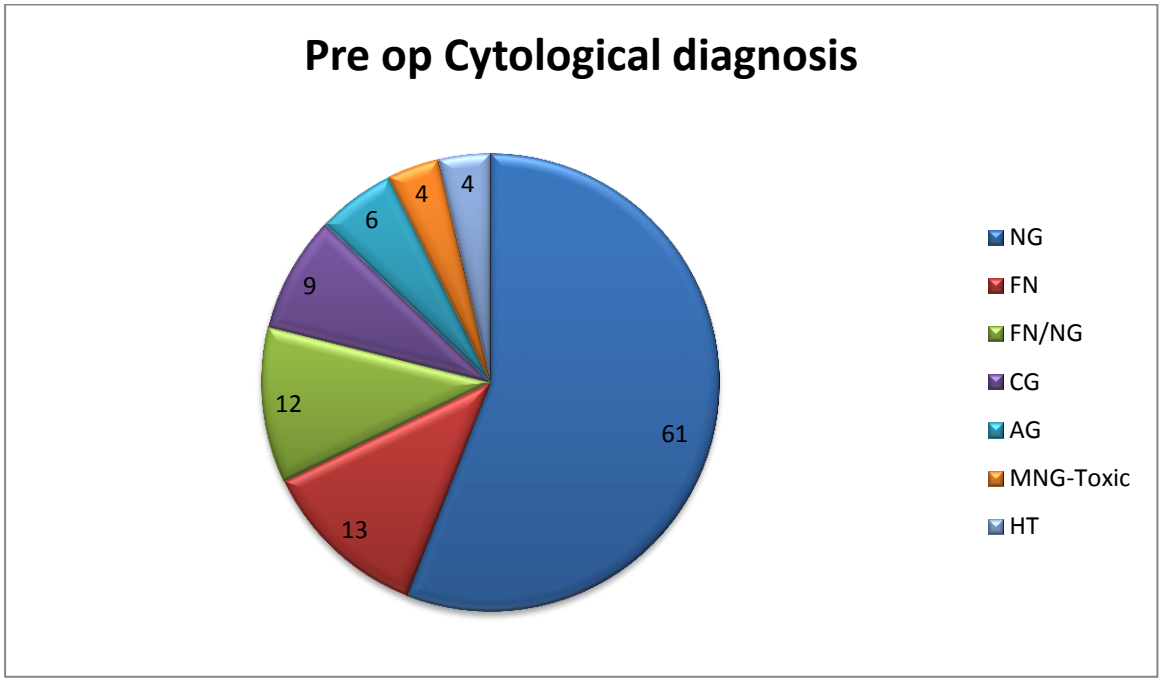
CLINICAL PRESENTATION:

Of all cases there were 55 patients (46 females and 9 males) presented with SNG, 48 patients(46 females and 2 males) with MNG and 8 patients (4 females and 4 males) with diffuse goiter. For MNG female to male ratio is **22:1**, for SNG it is around **5:1** and for diffuse goiter it is **1:1**



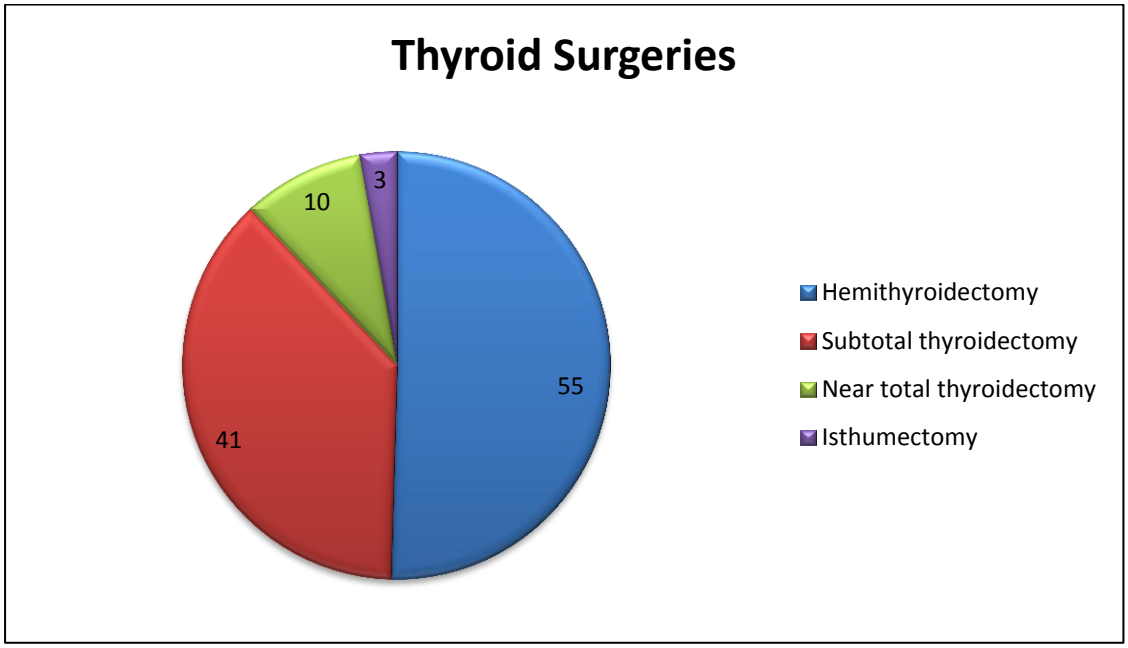
Of 8 patients with diffuse goiter ultrasound detected multinodularity in 2 patients. And 5 of them were having hyperthyroid hormonal profile. And 4 of them had FNAC finding of nodular goiter with toxic changes. Majority of patients with SNG having right side involvement (35 of 55 patients). 18 patients had left side swelling and 2 patients had isthmus nodule. The right to left ratio was around 2:1.

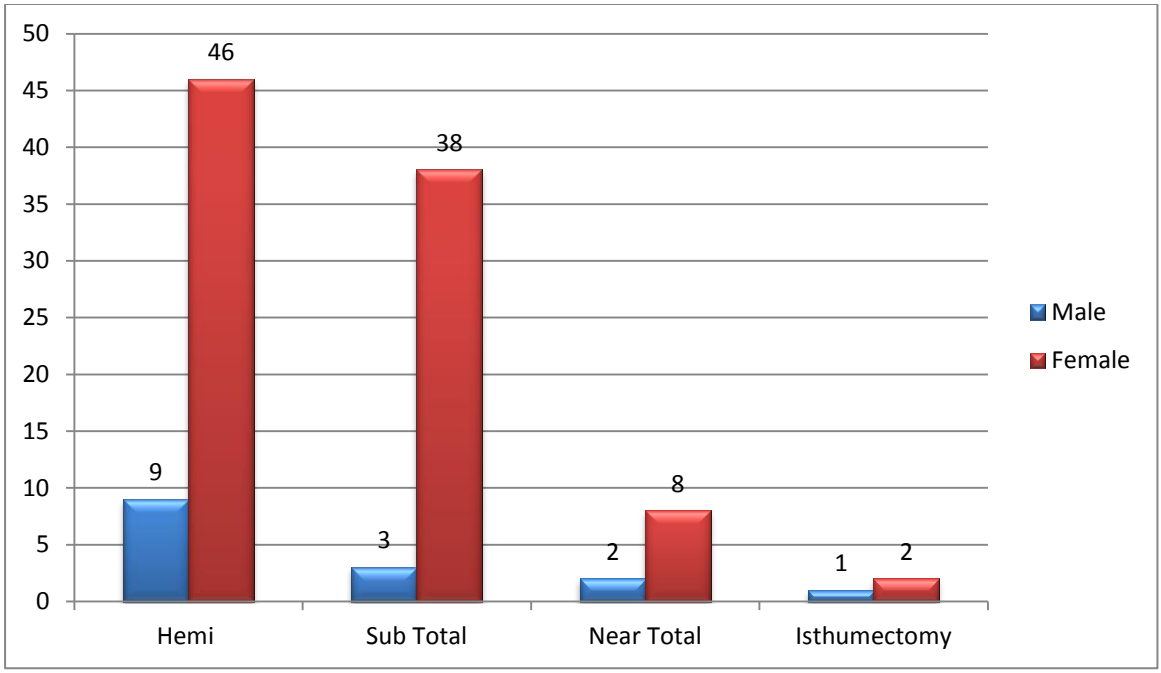
PRE-OP CYTOLOGICAL DIAGNOSIS OF BENIGN THYROID DISEASES:



The most common cytological diagnosis found was nodular goiter, around **56%**. Of 109 patients 12 patients had uncertain diagnosis of follicular neoplasm/nodular goiter and 13 patients had follicular neoplasm. 9 patients had colloid goiter, 6 patients had adenomatous goiter, 4 patients toxic goiter and 4 patients had Hashimoto's thyroiditis.

THYROID SURGERIES PERFORMED FOR BENIGN THYROID DISEASES:

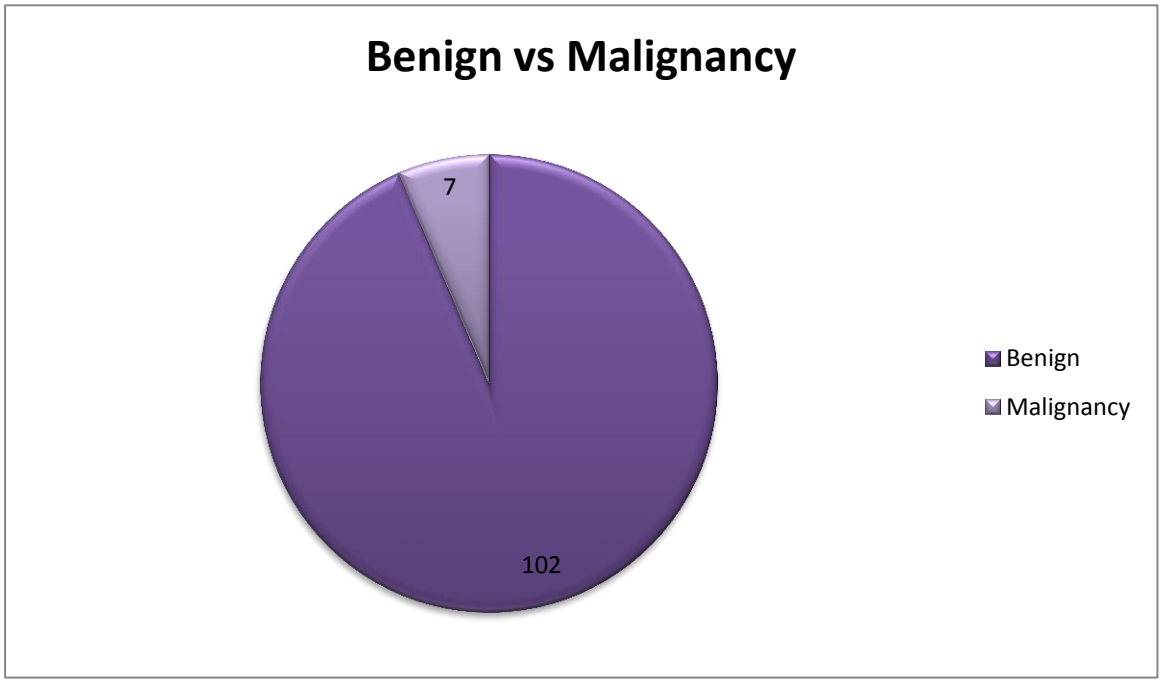




Hemithyroidectomy was the most commonly performed procedure, around 50%. Hemithyroidectomy most commonly performed for solitary nodular disease, in some patients hemithyroidectomy was done for multinodular disease occupying single lobe. Of 3 isthumectomies, 2 were done for nodular goiter in isthumus and 1 was done in emergency setup in patient with respiratory obstruction along with tracheostomy. This patient had cytological diagnosis of Hashimoto's thyroiditis.

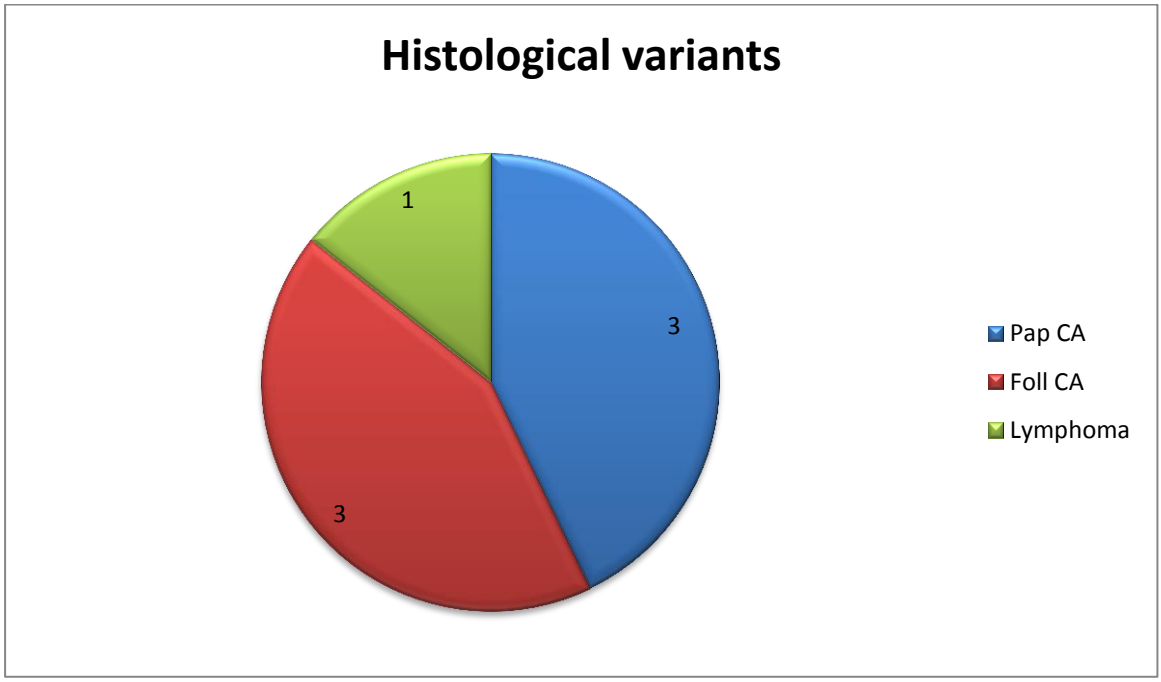
INCIDENCE OF MALIGNANCY:

Incidence of malignancy in patients undergoing surgery for benign thyroid diseases found was **6.4%**. Total number of malignancies detected by post operative histopathological examination were **7** out of 109 cases.



HISTOLOGICAL VARIANTS OF MALIGNANCIES:

Of total 7 malignacies, 6 were well differentiated malignancies including 3 papillary carcinomas and 3 follicular carcinomas that arose from thyroid follicular epithelium and 1 was low grade lymphoma.



CASES	AGE/SEX	FNAC	DIAGNOSIS	PROCEDURE	HPE
Case 1	30/F	NG	SNG Rt	Rt hemithyroidectomy	Follicular carcinoma
Case 2	34/M	NG	SNG Rt	Rt hemithyroidectomy	Papillary carcinoma
Case 3	30/F	FN	SNG Rt	Rt hemithyroidectomy	Follicular carcinoma
Case 4	46/F	HT	MNG	N/T thyroidectomy	Microscopic papillary Ca
Case 5	58/F	NG	MNG	N/T thyroidectomy	Microscopic papillary Ca
Case 6	55/M	HT	DG	Isthumectomy	Low grade Lymphoma
Case 7	40/F	FN	MNG	S/T thyroidectomy	Follicular carcinoma

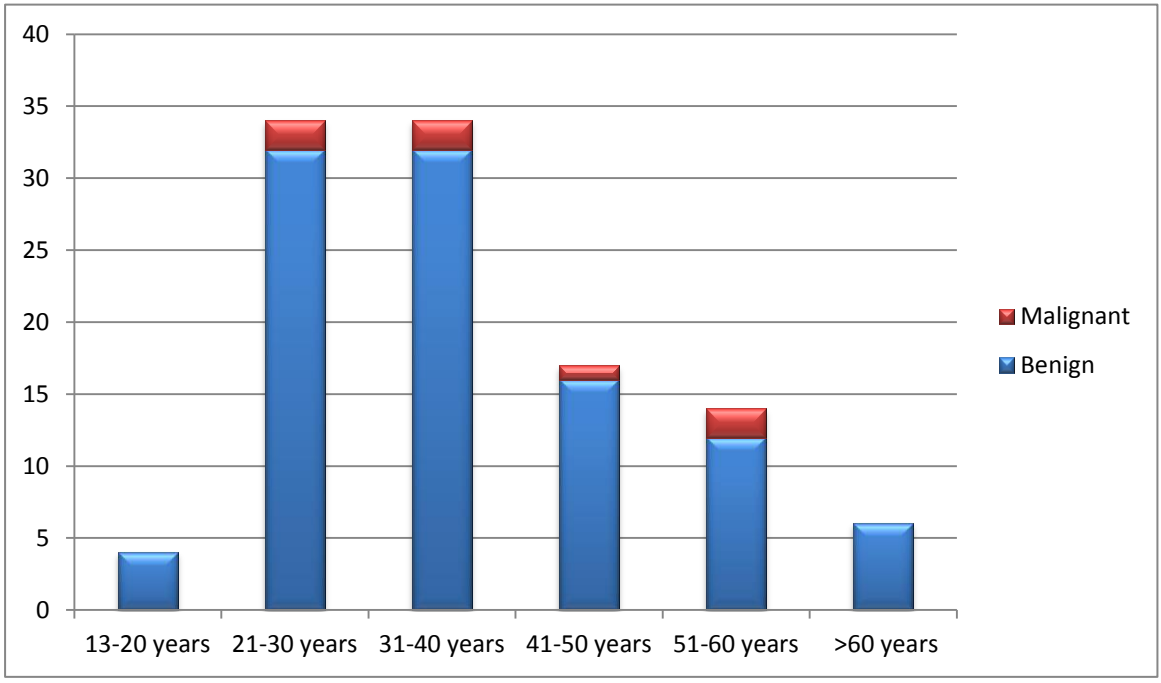
Of 3 papillary carcinomas 2 were microscopic papillary carcinoma in non dominant nodules of around 4mm and 6mm in largest diameter, they existed amidst their original pathology(MNG & Hashimoto's thyroiditis). No multifocality noted. 1 patient was diasnosed as papillary carcinoma following hemithyroidectomy, he underwent completion thyroidectomy 2 months later. Completion thyroidectomy specimen was also harbouring tumor.

Of 3 follicular carcinomas one was minimally invasive follicular carcinoma, not completely penetrating the capsule and one was low grade follicular carcinoma. Third one was the invasive follicular carcinoma with vascular and capsule invasion.

One case of low grade lymphoma was diagnosed following isthumectomy in emergency setup.

AGE DISTRIBUTION OF INCIDENTAL MALIGNANCIES:

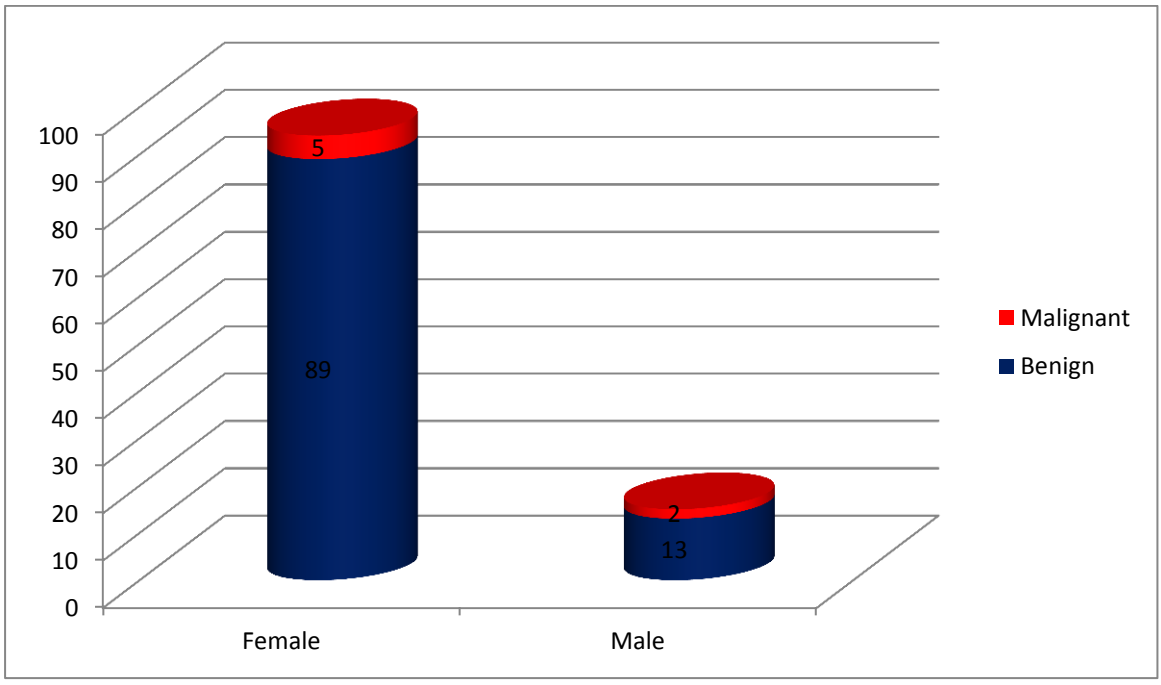
There were 4 cases of incidental malignancies between 21-40 years age group and 3 cases of incidental malignancies between 41-60 years age group. The mean age for presentation of incidental malignancy is **41.9 years**.



INCIDENTAL MALIGNANCY – SEX & CLINICAL PRESENTATIONS:

Incidental malignancy was diagnosed 2 out of 15 male patients, **13.3%** of all male cases. And in female patients 5 cases of malignancy diagnosed out of 94 patients,**5.3%** of all female cases.

GOITER	SEX	BENIGN	MALIGNANT	TOTAL
SNG	Male	8	1	9
	Female	44	2	46
MNG	Male	2	-	2
	Female	41	3	44
DIFFUSE GOITER	Male	3	1	4
	Female	4	-	4
TOTAL		102	7	109

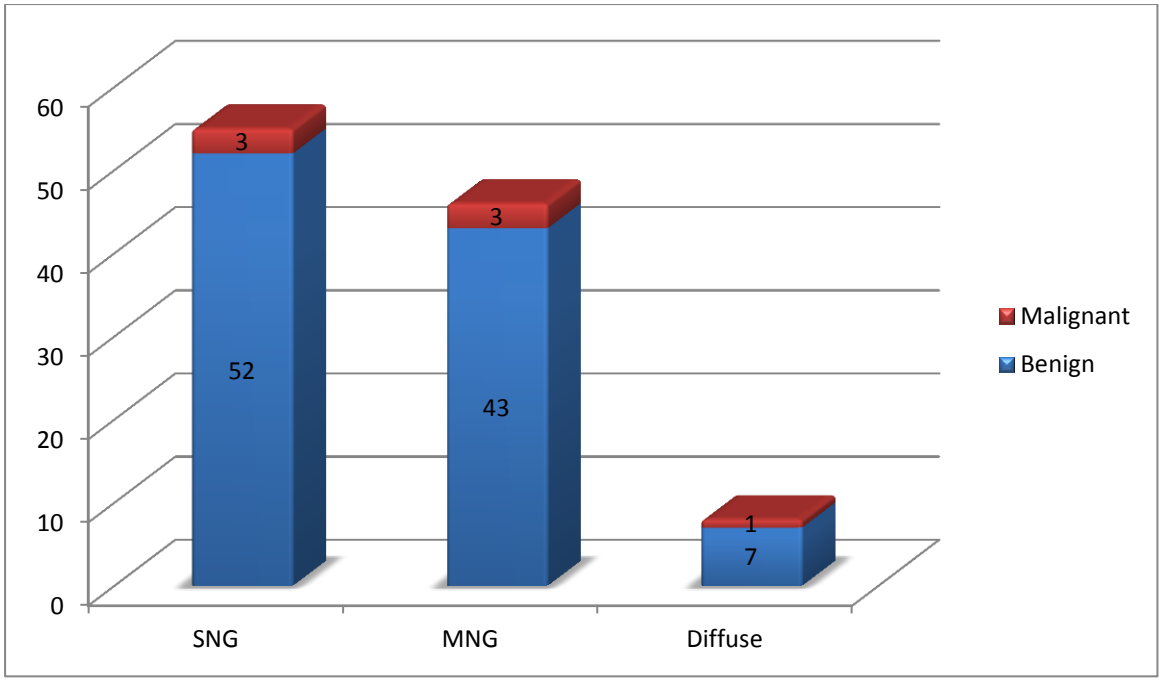


NATURE OF THYROID ENLARGEMENT:

3 cases of incidental malignancies were diagnosed in 55 cases of SNG. Incidence in SNG is **5.4%**.

3 cases of incidental malignancies were diagnosed in 46 cases of SNG. Incidence in MNG is **6.5%**.

One case of incidental malignancy was diagnosed in 8 cases of diffuse goiter. Incidence in diffuse goiter is **12.5%**.

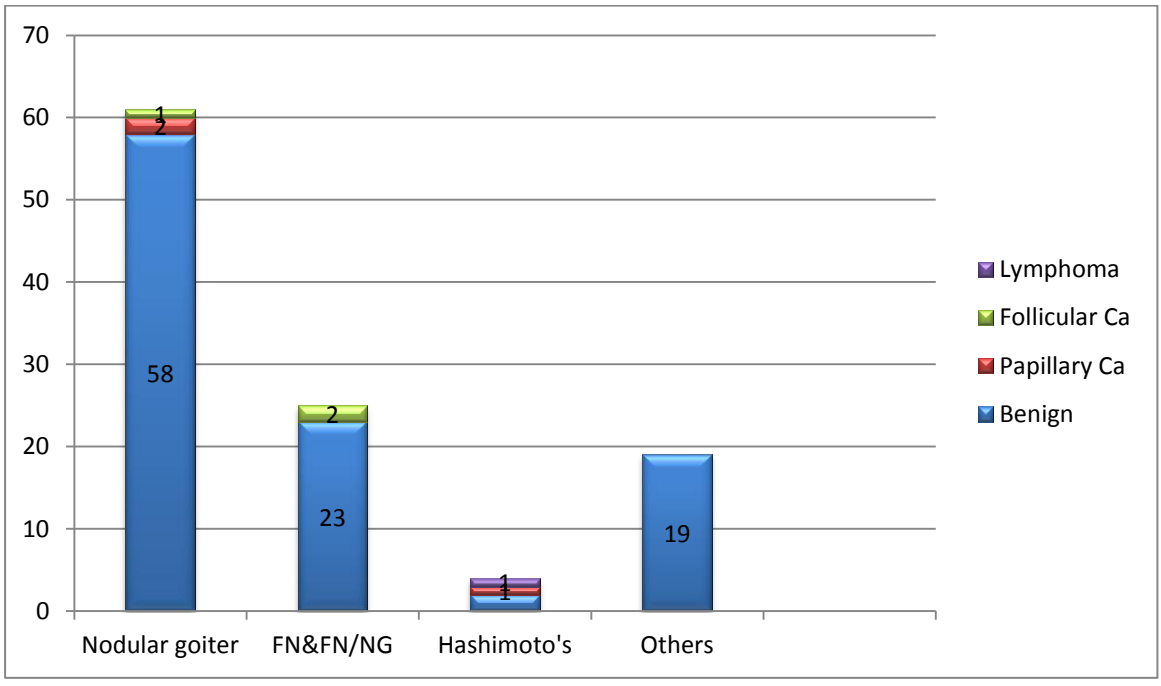


CYTOLOGICAL CORRELATION WITH INCIDENTAL MALIGNANCIES:

Malignancy detected in 3 patients out of 61 patients with cytological diagnosis of nodular goiter (including MNG). Incidence of malignancy in nodular goiter was **4.9%**.

Malignancy detected in 2 patients out of 25 patients with follicular neoplasm & follicular neoplasm/nodular goiter. Incidence of malignancy in FN & FN/NG was **8.0%**.

Malignancy detected in 2 patients out of 4 patients with Hashimoto's thyroiditis. Incidence of malignancy in Hashimoto's thyroiditis was **50.0%**.



SURGICAL PROCEDURES AND MALIGNACIES

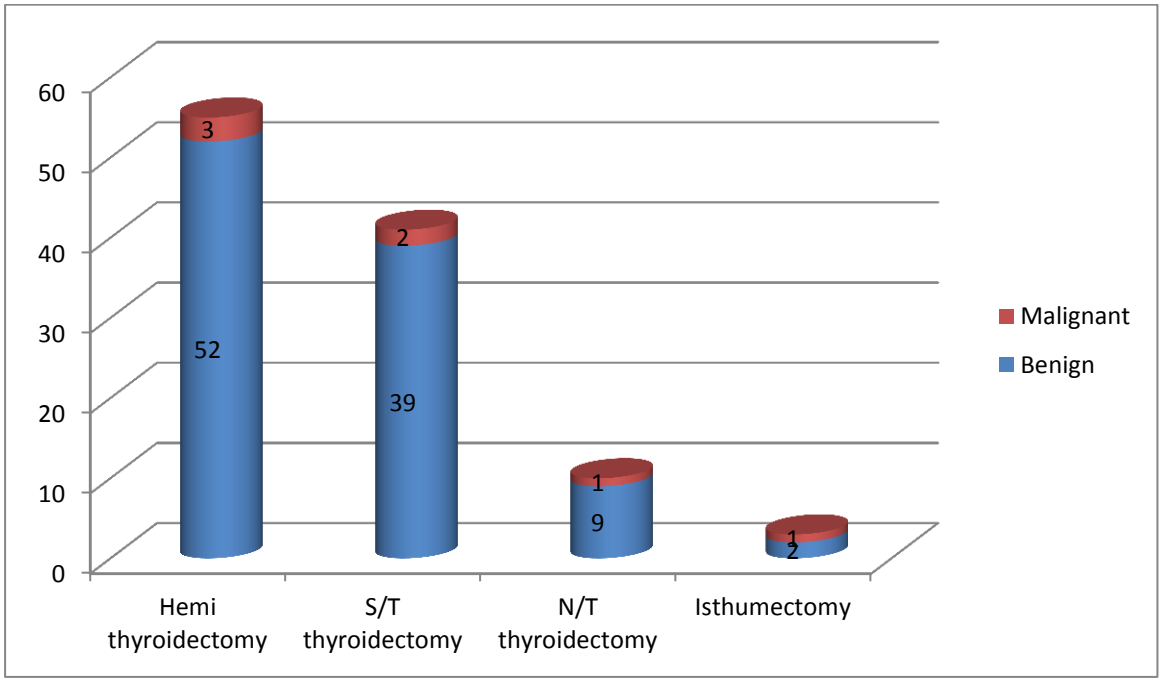
Out of 55 hemithyroidectomies 3 cases reported as malignancy. They were 2 follicular carcinomas and 1 papillary carcinoma. Completion thyroidectomy for all three cases were performed. For patients operated for follicular carcinoma there was no evidence of malignancy. For patient operated for papillary carcinoma residual thyroid tissue also had evidence of malignancy.

We have done subtotal thyroidectomy for 41 patients, of them one patient had microscopic papillary carcinoma which was in the same lobe of nodular goiter. Another patient had follicular carcinoma limited to thyroid.

We have performed 10 near total thyroidectomies of them one had microscopic papillary carcinoma which was a single lesion in the background of Hashimoto's thyroiditis.

Three patients underwent isthumectomy. Two were done under elective setting of solitary nodular colloid goiter in isthmus. One was performed under emergency setting along with tracheostomy to relieve respiratory obstruction who had FNAC report of Hashimoto's thyroiditis. That patient's HPE report was Low grade Lymphoma.

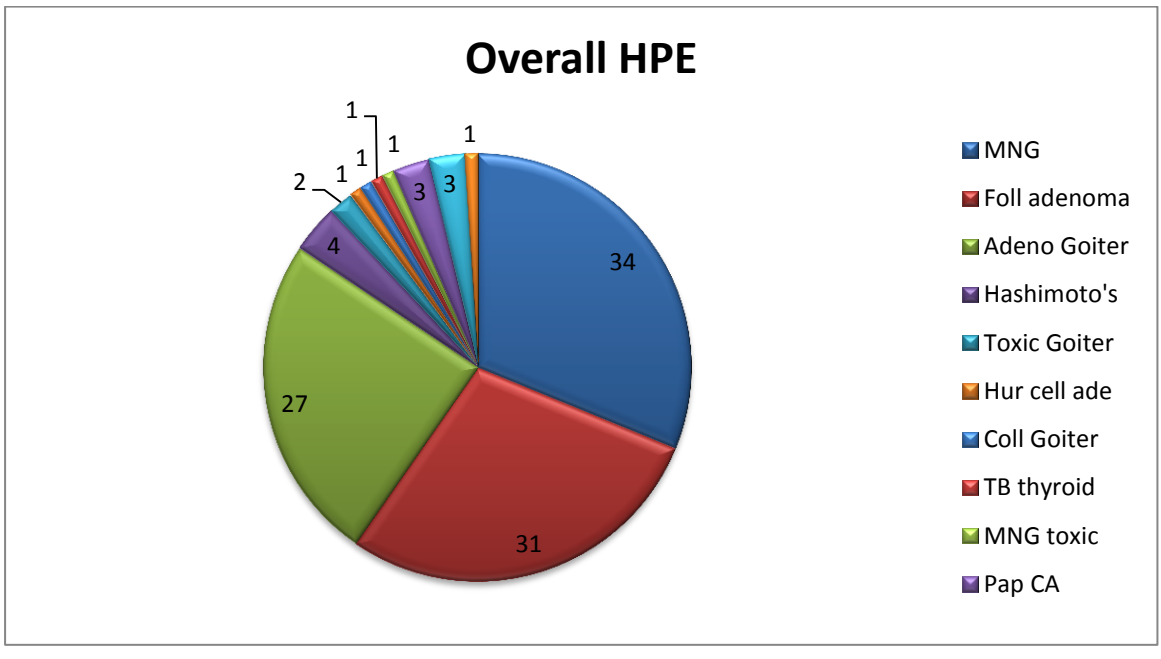
DISTRIBUTION ACCORDING TO SURGICAL PROCEDURES:



We have performed surgery for 4 patients with Hashimoto's thyroiditis. Three of them presented like MNG with pressure symptoms. Of them one patient had microscopic papillary carcinoma in the background of Hashimoto's thyroiditis. One patient with cytological diagnosis of Hashimoto's underwent isthumectomy and HPE proved to be low grade lymphoma.

OVERALL HPE REPORTS FOLLOWING SURGERY FOR BENIGN THYROID DISEASES :

DISEASES	NO.OF.CASES
Multinodular goiter	34
Follicular adenoma	31
Adenomatous goiter	27
Hashimoto's thyroiditis	4
Papillary carcinoma	3
Follicular carcinoma	3
Toxic goiter	2
Lymphoma	1
Colloid goiter	1
Hurthle cell adenoma	1
TB thyroid	1
MNG toxic	1
TOTAL	**109**



DISCUSSION

Totally 109 cases of benign thyroid diseases were operated in our hospital in the study period. In 109 cases 94 were female and 15 were male with female to male ratio is 6.3:1consistent with the study of Foad Ali Moosa[9]et al. Overall mean age of presentation was 38.4 years and the range was16-88 years.

The most common clinical presentation was SNG- 50.5%, followed by MNG-42.2%. Diffuse goiter constituted around 7.3%.. For patients with SNG mean age of presentation was35.7years. For patients with MNG mean age of presentation was 39.5 years.

The most common benign cytological diagnosis was nodular goiter presented in 56% of cases. For its indeterminate nature, cytology reported as follicular neoplasm and follicular neoplasm/nodular goiter are considered as a single entity and compromised around 23% of all benign cases. Remaining was contributed by colloid goiter, adenomatous goiter , MNG toxic goiter and Hashimoto's thyroiditis in order of decreasing frequency.

HPE reports of the patients treated surgically for benign thyroid diseases were recorded and the results were analysed. The findings were expressed as absolute numbers and as percentages.

Incidence of malignancy in this series was 7 cases in 109 cases, that constituted 6.4%. Overall range of age was 30-58 years and the mean age of presentation was 41.85years.3 patients presented like SNG, 3 patients presented like MNG and 1 patient presented with diffuse goiter.

The age range of SNG with malignancy was 30-34years. The mean age for SNG presenting malignancy was 31.3years. It was significantly lower than overall mean age for presentation of malignancy and was also lower than the mean of benign clinical presentation of SNG.

The age range of MNG with malignancy was 40-58 years with the mean age of presentation 48 years. It was significantly higher than overall mean age for presentation of malignancy and higher than mean age for presentation of MNG

Of the seven cases two were microscopic papillary carcinoma, one was papillary carcinoma, three were follicular carcinoma and one lymphoma. Of the 3 follicular carcinomas, one was widely invasive follicular carcinoma, one was minimally invasive follicular carcinoma and one was low grade follicular carcinoma. This observation was consistant with the study of Hee-Nee Pang et al[10] in reporting papillary carcinomas, follicular carcinomas and lymphoma be detected in nodular goiters.

In this study the incidence of papillary microcarcinoma in MNG was around 4.2% , consistent with the study of Hee-Nee Pang et al[10], that showed 4.9% of incidence. Incidence of papillary microcarcinoma in overall benign diseases was around 1.8%. According to Harach et al[12] papillary microcarcinoma was found in around 35% autopsy studies. In various surgical studies, incidence of papillary microcarcinoma in thyroidectomies showing incidence ranging from 2-25% (McConahey et al[13] and Fink A et al[14]) . GH Sakorafas et al[11] showed incidence of papillary micro carcinoma 7.1% in presumably benign thyroid diseases. CarliniM et all[15] showed 21.6% incidence MPC in benign thyroid diseases. Jean-Michel Prades et al[29]., and Roberta Gelmini et al[30]., showed incidence of 12.2% and 11.1% respectively.

Incidence of malignancy diagnosed in MNG was 6.25%. Of three cases two were papillary carcinoma and one was follicular carcinoma. Waseem Memon [16] et al study shows incidental malignancy in MNG is 7.6%. There was no details regarding papillary micro carcinoma in that study.

A study conducted by Pedamallu et al[17] showed incidence of malignancy in MNG was 10.2%, majority of cases(9 out of 10) being papillary carcinoma. A study from Hanumanthappa[18] et al also showed similar findings.

Review of the literature in all the above mentioned studies showed the predominant incidental malignancy occurring in MNG is papillary carcinoma. This study was also consistent with that.

Elio Roti et al[19] meta analysis study showed age range for microscopic papillary carcinoma(MPC) was 41.9 to 55 years. In the present study age of the two patients were 46 and 58 years. It also showed female to male ratio in MPC was 4.9:1. In the present study we had only 2 cases and they both were females.

A study conducted by Ranil Fernando et al[20] showed incidental malignancy in 8.8% of patients with benign thyroid diseases with papillary and follicular carcinomas occurring in equal frequency . This study also showed papillary and follicular carcinoma having equal incidence of occurrence in overall benign thyroid diseases.

There were 2 cases of follicular carcinoma diagnosed in 25 cases of FN&FN/NG. The incidence was 8%. Whereas Carrie C. Lubitz et al[21] showed the incidence as 11%. A study from Micheal Tuttle et al[22] showed incidence of malignancy in follicular neoplasm was 21%. Zubair W Baloch et al[23] demonstrated the incidence as 31%.

Incidence of malignancy in Hashimoto's thyroiditis(HT) was 50% in this study. Four cases of Hashimoto's thyroiditis were operated for

pressure symptoms. There was 1 case of papillary microcarcinoma existing in the background of HT and 1 case of low grade lymphoma presented with acute respiratory compromise. Study from Elias E. Mazokopakis et al[24] showed coexistence of HT and Papillary carcinoma was present in 8.6% of thyroidectomy specimens. Incidence of papillary carcinoma in HT in this study was 25%. A study performed by Daniel Replinger et al[25] showed detection of Papillary carcinoma in 29% of patients operated for HT. This was consistent with the incidence of papillary carcinoma in HT in this series.

Although primary lymphoma in thyroid is rare, there are several case reports of lymphoma arising from the pre existing HT in the thyroid that presented as acute airway compromise, Arullendran et al[28] , C D Thomas et al [27] etc. Scholefield JH et al[26] showed 23% of lymphomas had pre existing HT. The high incidence of lymphoma in this series might be due to low volume of cases operated for Hashimoto's thyroiditis.

SUMMARY

1. Benign thyroid diseases most commonly affected females, F:M=6.3:1. The most common clinical presentation was SNG in this study, although the most common final HPE diagnosis was MNG. Patients with SNG presented earlier age group than MNG.
2. Incidence of malignancy in this study was 6.4%. Patients with MNG had slightly higher incidence of harbouring malignancy than SNG. Male patients had significantly higher incidence (>2 fold) than females.
3. According to this study, when considering age as a predictive factor incidence of malignancy could not be underestimated in young adult patients with SNG(mean age31.3years). Whereas incidence of malignancy in patients with MNG had older age group of distribution(mean age 48 years).
4. Papillary micro carcinoma was the most commonly identified malignancy in patients with MNG and Follicular carcinoma in patients with SNG.
5. Incidence of follicular carcinoma in patients with follicular neoplasm was 8%.

CONCLUSION

The studies of Micheal Prades et al[29]., Carlini et al[15]., Roberta Gelmini et al[30]., showed an incidence of malignancy in benign thyroid diseases was above 10% and they were suggesting that Total thyroidectomy for all benign thyroid diseases in order to avoid second surgery. But the incidence in our study was only 6.4%. Considering the morbidity associated with the total thyroidectomy in all patients, it can be concluded that subjecting the specimens of conservative thyroid surgeries, for serial sectioning technique in Histopathological examination will be sufficient, so that the positive cases can be identified and treated suitably.

REFERENCES

1. Last's anatomy, Regional and Applied, Chummy S Sinnatamby, Thyroid gland, chapter 6 (339-341).

2. Text book of human histology, IB singh, 4th edition, The Thyroid Gland page no. 306-308.

3. Schwartz's Principles and Practices of surgery, 9th edition, Charles Brunicardi et al., Chapter 38(1343-1374).

4. Sabiston textbook of surgery, 18th edition by Courtney et al, Thyroid, section VIII, chapter 36(917-954).

5. Harrison's principles of internal medicine, 17th edition, volume II, chapter 335, Disorders of Thyroid gland (2224-2229)

6. Bailey & Love's short practice of surgery, 24th edition, the thyroid gland and thyroglossal tract, chapter 53 (776-824).

7. Robbin's and Cotran Pathologic basis of disease, 7th edition, thyroid gland, the endocrine system, unit II, chapter 24 (1164-1183).

8. Rosai and Auckerman's SURGICAL PATHOLOGY, 10th edition, vol 1, chapter 9; (487-564)

9. FOAD ALI MOOSA et al, Pakistan journal of sugery, volume 23, issue 2, 2007, page no 129-133.

10. Hee-Nee Pang et al, Ann Acad Med Singapore 2007;36;241-3

11. GH Sakorafas et al, Microscopic papillary thyroid cancer as an incidental finding in patients treated surgically for presumably benign thyroid disease. J Postgrad Med 2007;53:23-6

12. Harach HR, et al. Occult papillary carcinoma of the thyroid; A "normal" finding in Finland. A systemic autopsy study. Cancer 1985;56:531-8.

13. McConahey WM, et al. Papillary thyroid cancer treated at the Mayo Clinic, 1946 through 1970: Initial manifestation, pathologic findings, therapy and outcome. Mayo Clin Proc 1986;61:978-96.

14. Fink A, et al. Occult micropapillary carcinoma associated with benign follicular thyroid disease and unrelated thyroid neoplasms. Mod Pathol 1996;9: 816-20

15. Carlini M et al, incidental thyroid microcarcinoma in benign thyroid disease. Ital. 2006 Jul-Aug;58(4):441-7

16. Waseem Memon et al, incidence of thyroid carcinoma in multinodular goiters, Isra university hospital, Hyderabad, Pakistan.

17. R. Pedamallu, et al: Incidence of occult carcinoma in multinodular goiter using histopathological findings. *The Internet Journal of Surgery*. 2008 Volume 17 Number 1.

18. Hanumanthappa M.B.et al., The Incidence of Malignancy in Multinodular goiter, journal of clinical and diagnostic research. 2012 april,vol6(2):267-270.

19. Elio Roti et al, thyroid papillary microcarcinoma:a descriptive and metaanalysis study, European journal of endocrinology,2008, 159 659-673.

20. Ranil Fernando et al, incidental occult carcinoms in total thyroidectomy for benign diseases of the thyroid, Ceylon medical journal, vol 54, no.1, march 2009 4-6.

21. Carrie C. Lubitz,et al Thyroid. January 2010, 20(1): 25-31. doi:10.1089/thy.2009.0208.

22. R. MICHAEL TUTTLE, et al Thyroid. May 1998, 8(5): 377-383. doi:10.1089/thy.1998.8.377.

23. Baloch, Z. W.et al P. K. (2002), Diagnosis of "follicular neoplasm": A gray zone in thyroid fine-needle aspiration cytology. Diagn. Cytopathol., 26: 41–44. doi: 10.1002/dc.10043.

24. Elias E. Mazokopakis et al, coexistence of hashimto's thyroiditis with papillary thyroid carcinoma. A retrospective study, HORMONES 2010,9(4):312-317.

25. Daniel Repplinger, et al Is Hashimoto's thyroiditis a risk factor for papillary thyroid cancer? J Surg Res. 2008 November; 150(1): 49–52.

26. Scholefield et al Lymphoma arising from Hashimoto's thyroiditis: an unusual cause of acute stridor. Eur J Surg Oncol. 1992 Apr;18(2):89-92.

27. C G Thomas Jr et al, surgical intervention in hashimoto's thyroiditis, Ann surg. 1981 june;193(6):769-776.

28. Arullendran et al , Lymphoma arising from Hashimoto's thyroiditis: an unusual cause of acute stridor.J Surg Res. 2008 November; 150(1): 49–52.

29. Jean-Michel Prades et al., MNG surgical management and histopathological findings. Eur Arch Otorhinolaryngol(2002) 259:217-221.

30. Roberta Gelmini et al ITC: retrospective study in a series of 737 patients treated for benign disease. Ann. Ital. Chir., 2010 81:421-427.

31. Farquharson's text book of operative general surgery, 9 th edition, surgery of the neck, chapter 9 (163-167).

ANNEXURE I

A STUDY ON INCIDENCE OF MALIGNANCY IN PATIENTS UNDERGOING SURGERY FOR BENIGN THYROID DISEASES

Name : Age/Sex : I.P. No. :

Address : Occupation :

CHIEF COMPLAINTS : 1.

2.

Detailed History :

- H/O Swelling in the neck

Duration : Location: Size:

Onset : Progression:

- H/O Pain over the swelling : Y/N
- H/O heat/cold intolerance :
- H/O weight gain/weight loss :
- H/O palpitatations, tremors, excessive sweating :
- H/O loss of hair :
- H/O constipation :
- H/O menstrual abnormalities :
- H/O dysphagia/dyspnoea/dysphonia :
- H/O falling of eyebrows :

Past History :

- H/O any chronic illness/ chronic drug intake/ surgeries :
- H/O any irradiation in the past :

Personal History :

- Diet habit :
- H/O Smoking and alcohol intake :
- Marital History :

Family History :

- H/O any similar illness among family members :

GENERAL EXAMINATION :

LOCAL EXAMINATION OF NECK :

- Description of the swelling :

- Tracheal position :
- Carotid pulsation :
- Examination of neck nodes :

EYE SIGNS :

Pretibial myxodema : Y/N Tremors : Y/N

Tongue fibrillation : Y/N Bruit : Y/N

E.N.T. Examination :

C.V.S :

R.S :

ABDOMEN :

C.N.S :

INVESTIGATIONS

1. Blood – Hb%: TC: DC: ESR: Platelets:
2. Blood Urea : Blood Sugar : Serum Creatinine:
3. Urine – Alb : Sugar : Deposits :
4. Chest X-ray
5. E.C.G
6. Thyroid Function Tests
7. U.S.G. Neck
8. F.N.A.C
9. CT/MRI

DIAGNOSIS :

MANAGEMENT :

- MEDICAL :

- SURGICAL :

INTRA OPERATIVE FINDINGS :

FINAL H.P.E. REPORT :

ANNEXURE II

ABBREVIATIONS:

AGES – Age, Grade of the tumor, Extent, Size

AMES – Age, metastases, extrathyroidal extension, size

CG - Colloid goiter

CT - Computarised tomography

DIT - Di-iodotyrosine

MIT - Mono-iodotyrosine

FNAC - Fine needle aspiration cytology

FDG - Fluoro deoxy glucose

FN - Follicular neoplasm

FT3 - Free tri-iodothyronine

FT4 - Free thyroxine

HPE - Histopathological examination

MACIS – metastases, age, completeness of surgery, invasion, size

MEN - Multiple endocrine neoplasia

MIT - Mono-iodotyrosine

MNG - Multinodular goiter

MPC - Papillary micro carcinoma

MTC - Medullary thyroid carcinoma

NG - Nodular goiter

PET - Positran emission tomography

RAI - Radio active iodine

Tg - Thyroglobulin

TSH - Thyroid stimulating hormone

USG - Ultrasonogram

S.NO	NAME	AGE	SEX	IP. NO	CLINICAL	USG	TFT	FNAC	PROCEDURE	HPE REPORT
1	Madhammal	32	Female	42877	MNG-Non toxic	MNG	Euthyroid	FN/ NG	Near total thyroidectomy	Adenomatous goitre
2	vijayalakshmi	40	Female	41477	SNG-Lt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	Follicular adenoma
3	Palanathal	60	Female	44661	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
4	saritha	21	Female	46659	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Hashimoto's thyroiditis
5	saroja	30	Female	47359	SNG-Rt lobe	SNG	Euthyroid	FN	Rt hemithyroidectomy	Follicular adenoma
6	vasanthi	42	Female	38486	SNG-Rt lobe	SNG	Euthyroid	Colloid goitre	Rt hemithyroidectomy	MNG
7	kaveri	40	Female	48486	Diffuse goitre	Diffuse goitre	Hyperthyroid	MNG-TOXIC	Subtotal thyroidectomy	Toxic goitre
8	Arukkani	40	Female	46255	SNG-Rt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	Follicular adenoma
9	Kaliyammal	57	Female	48058	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Hurthlecell adenoma
10	Anbarasi	45	Female	50108	MNG-Non toxic	MNG	Euthyroid	Hashimoto's thyroiditis	Subtotal thyroidectomy	Hashimoto's thyroiditis
11	Rajarathinam	55	Male	56743	Diffuse goitre	Diffuse goitre	Euthyroid	Hashimoto's thyroiditis	Isthumectomy	Low grade lymphoma
12	Deivanai	30	Female	50106	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
13	Vanitha	56	Female	50038	SNG-Rt lobe	SNG	Euthyroid	FN/ NG	Rt hemithyroidectomy	MNG
14	Ravikumar	25	Male	49680	MNG-Non toxic	MNG	Euthyroid	NG	Near total thyroidectomy	Adenomatous goitre
15	Mariyagnanam	47	Female	51556	MNG-Non toxic	MNG	Euthyroid	Adenomatous goitre	Subtotal thyroidectomy	Adenomatous goitre
16	Dhanalakshmi	29	Female	50999	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
17	Rajalakshmi	60	Female	52559	MNG-Non toxic	MNG	Euthyroid	MNG	Subtotal thyroidectomy	MNG
18	Mani	65	Male	52372	SNG-Rt lobe	SNG	Hyperthyroid	Colloid goitre	Rt hemithyroidectomy	MNG
19	Mala	40	Female	57442	MNG-Non toxic	MNG	Euthyroid	FN/NG	Rt hemithyroidectomy	Follicular adenoma
20	Subbulakshmi	57	Female	59652	MNG-Non toxic	MNG	Euthyroid	MNG	Subtotal thyroidectomy	MNG
21	Suryaprakash	17	Male	59094	SNG-Rt lobe	SNG	Euthyroid	FN	Rt hemithyroidectomy	Tuberculous lesion
22	Nagarajan	35	Male	53367	Diffuse goitre	MNG	Hyperthyroid	MNG-TOXIC	Subtotal thyroidectomy	MNG-TOXIC
23	Sameera	27	Female	59922	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
24	Munirabanu	26	Female	57474	SNG-Lt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	Follicular adenoma
25	Sudharani	25	Female	61303	SNG-Lt lobe	SNG	Euthyroid	FN/NG	Lt hemithyroidectomy	Follicular adenoma
26	Savithri	40	Female	62094	SNG-Rt lobe	SNG	Euthyroid	FN/NG	Rt hemithyroidectomy	Adenomatous goitre
27	Krishnaveni	50	Female	62088	MNG-Non toxic	MNG	Euthyroid	FN	Subtotal thyroidectomy	MNG
28	Lakshmi	30	Female	63631	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre

29	Dhanabhakiyam	36	Female	63627	SNG-Rt lobe	SNG	Euthyroid	FN	Rt hemithyroidectomy	Follicular adenoma
30	Chandra	45	Female	63451	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Adenomatous goitre
31	Girija	42	Female	67258	MNG-Non toxic	MNG	Euthyroid	FN	Near total thyroidectomy	MNG
32	Gnanasundari	28	Female	67867	SNG-Rt lobe	SNG	Euthyroid	Colloid goitre	Rt hemithyroidectomy	Follicular adenoma
33	Selvi	30	Female	70176	SNG-Rt lobe	SNG	Euthyroid	FN/NG	Rt hemithyroidectomy	Follicular adenoma
34	Anandalakshmi	32	Female	72609	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
35	Ambika	29	Female	814	SNG-Rt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Adenomatous goitre
36	Saraswathy	65	Female	2639	Diffuse goitre	Diffuse goitre	Hyperthyroid	MNG-TOXIC	Subtotal thyroidectomy	Toxic goitre
37	Devi	36	Female	4256	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
38	Vimala	36	Female	8086	MNG-Non toxic	MNG	Euthyroid	MNG	Subtotal thyroidectomy	MNG
39	Sainaba	50	Female	7160	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
40	Subbammal	65	Female	8420	Diffuse goitre	Diffuse goitre	Euthyroid	Colloid goitre	Subtotal thyroidectomy	MNG
41	Selvi	23	Female	7468	SNG-Rt lobe	SNG	Euthyroid	FN	Subtotal thyroidectomy	Follicular adenoma
42	Rahim	88	Male	7624	SNG-Lt lobe	MNG	Euthyroid	Colloid goitre	Lt hemithyroidectomy	MNG
43	Neelambal	27	Female	12037	MNG-Non toxic	MNG	Euthyroid	Colloid goitre	Subtotal thyroidectomy	MNG
44	Margret rani	55	Female	18380	Diffuse goitre	MNG	Hyperthyroid	MNG-TOXIC	Near total thyroidectomy	Adenomatous goitre
45	Jaya sakthivel	55	Male	9530	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Follicular adenoma
46	Vijayalakshmi	40	Female	14594	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
47	Jemisha	33	Male	15532	Diffuse goitre	MNG	Hyperthyroid	FN/NG	Near total thyroidectomy	MNG
48	Maheswaran	25	Male	16589	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Adenomatous goitre
49	Maragadham	25	Female	16593	MNG-Non toxic	MNG	Euthyroid	Adenomatous goitre	Subtotal thyroidectomy	Adenomatous goitre
50	Pappammal	45	Female	17877	MNG-Non toxic	MNG	Euthyroid	MNG	Near total thyroidectomy	MNG
51	Krishnan	58	Male	15650	Diffuse goitre	Diffuse goitre	Euthyroid	Colloid goitre	Subtotal thyroidectomy	Colloid goitre
52	Chitra	39	Female	20967	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Follicular adenoma
53	Jansy	26	Female	23058	Isthmus nodule	Isthmus nodule	Euthyroid	NG	Isthumectomy	Adenomatous goitre
54	Arukkani	34	Female	21516	MNG-Non toxic	MNG	Euthyroid	Hashimoto's thyroiditis	Subtotal thyroidectomy	Hashimoto's thyroiditis
55	Radha	25	Female	46578	SNG-Lt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	Adenomatous goitre
56	Sulochana	36	Female	23024	SNG-Rt lobe	SNG	Euthyroid	FN/NG	Rt hemithyroidectomy	Follicular adenoma
57	Shameen	25	Female	22080	MNG-Non toxic	MNG	Euthyroid	FN/NG	Subtotal thyroidectomy	Follicular adenoma

58	Elizabeth	45	Female	32008	SNG-Rt lobe	SNG	Euthyroid	Adenomatous goitre	Rt hemithyroidectomy	Follicular adenoma
59	Ponnammal	55	Female	20784	MNG-Non toxic	MNG	Euthyroid	Adenomatous goitre	Subtotal thyroidectomy	Adenomatous goitre
60	Fathima	28	Female	24141	SNG-Rt lobe	MNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
61	Padma	38	Female	21744	SNG-Rt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	MNG
62	Thenmozhi	37	Female	21971	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
63	Radhika	32	Female	24970	SNG-Rt lobe	SNG	Euthyroid	FN	Rt hemithyroidectomy	Follicular adenoma
64	Kaliyammal	35	Female	26372	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
65	Kousalya	42	Female	27063	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	MNG
66	Jothimani	55	Female	24812	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
67	Sumathi	25	Female	27518	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
68	Bhuvaneshwari	45	Female	28305	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	MNG
69	Selvamani	46	Female	26883	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Follicular adenoma
70	Jeyasri	46	Female	28503	MNG-Non toxic	MNG	Euthyroid	Hashimoto's thyroiditis	Near total thyroidectomy	Microscopic -PAP Ca/Hashimotos
71	Mariammal	36	Female	27276	MNG-Non toxic	MNG	Euthyroid	NG	Near total thyroidectomy	Hashimoto's thyroiditis
72	Chandrakala	35	Female	34327	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	MNG
73	Neelavathy	58	Female	35863	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MIcroscopic -PAP Ca/MNG
74	Natchammal	49	Female	36120	SNG-Rt lobe	MNG-Rt lobe	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
75	Rajesh	36	Male	37737	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
76	Shanthi	28	Female	37306	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Adenomatous goitre
77	Nandhini	20	Female	38351	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
78	Radhika	27	Female	38347	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
79	Mahalakshmi	32	Female	38542	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
80	Rayathal	32	Female	37769	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Adenomatous goitre
81	Ponnammal	30	Female	38613	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular carcinoma
82	Thangamani	70	Female	32206	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
83	Revathy	27	Female	40752	SNG-Lt lobe	SNG	Euthyroid	FN	Lt hemithyroidectomy	Follicular adenoma
84	Valliyammal	50	Female	36616	MNG-Non toxic	MNG	Euthyroid	Adenomatous goitre	Subtotal thyroidectomy	Adenomatous goitre
85	Dhanabhakiyam	40	Female	41474	MNG-Non toxic	MNG	Euthyroid	NG	Near total thyroidectomy	MNG

86	Jannath	45	Female	41657	MNG-Non toxic	MNG	Euthyroid	MNG	Subtotal thyroidectomy	MNG
87	Shanmugasundaram	34	Male	48329	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Papillary carcinoma
88	Santhanam	53	Male	43076	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
89	Abhijeet Viswas	36	Male	44698	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
90	Ramathal	38	Female	44652	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
91	Pushpalatha	30	Female	45348	SNG-Rt lobe	SNG	Euthyroid	FN/NG	Rt hemithyroidectomy	Follicular carcinoma
92	Vijaya	36	Female	46586	SNG-Lt lobe	SNG	Euthyroid	FN/NG	Lt hemithyroidectomy	Follicular adenoma
93	Rukmani	55	Female	47918	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	MNG
94	Sathyapriya	16	Female	48148	Isthmus nodule	Isthmus nodule	Euthyroid	NG	Isthumectomy	Follicular adenoma
95	Chikmuthu	38	Male	51155	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Follicular adenoma
96	Arukkani	30	Female	60169	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Follicular adenoma
97	Selvi	43	Female	52949	SNG-Lt lobe	SNG	Euthyroid	Colloid goitre	Lt hemithyroidectomy	Follicular adenoma
98	Rani	29	Female	53325	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
99	Umadevi	23	Female	57985	SNG-Lt lobe	SNG	Euthyroid	NG	Lt hemithyroidectomy	Adenomatous goitre
100	Sudha	22	Female	58184	SNG-Rt lobe	SNG	Euthyroid	NG	Rt hemithyroidectomy	Follicular adenoma
101	Kanaga	26	Female	58816	MNG-Non toxic	MNG-Rt lobe	Euthyroid	NG	Rt hemithyroidectomy	Adenomatous goitre
102	Pavithra	17	Female	54309	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
103	Thangamani	25	Female	61601	SNG-Rt lobe	SNG	Euthyroid	Colloid goitre	Rt hemithyroidectomy	Adenomatous goitre
104	Sangeetha	29	Female	62490	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
105	Pappathi	40	Female	63882	MNG-Non toxic	MNG	Euthyroid	FN/NG	Near total thyroidectomy	Follicular carcinoma
106	Amalamary	62	Female	65155	MNG-Non toxic	MNG	Euthyroid	Adenomatous goitre	Rt hemithyroidectomy	Adenomatous goitre
107	Dhanalakshmi	34	Female	65759	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	MNG
108	velumani	21	Female	38765	MNG-Non toxic	MNG	Euthyroid	NG	Subtotal thyroidectomy	Adenomatous goitre
109	Lakshmi	35	Female	53170	MNG-Non toxic	MNG	Euthyroid	MNG	Subtotal thyroidectomy	Adenomatous goitre